LOUISIANA COASTAL AREA (LCA), LA - ECOSYSTEM RESTORTATION:

COASTWIDE ECOSYSTEM RESTORATION STUDY

ATTACHMENT EA-1

Alternatives

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ALTERNATIVES

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ATTACHMENT 1

ALTERNATIVES

INTRODUCTION

This attachment presents the subprovince alternatives developed for the Louisiana Coastal Area (LCA) Coastwide Ecosystem Restoration Study. Detailed discussions of the first three phases of framework formulation (Phase I = Establish Framework Objectives and Evaluation Criteria; Phase II = Assess Restoration Strategies from the Coast 2050 Plan; and Phase III = Develop and Evaluate Restoration Projects and Features) are contained in this attachment. For the sake of clarity, the information is reiterated within the Main Report and Appendix E about Phase IV = Develop and evaluate Alternatives – Select a Final Array of Coastwide Frameworks. Additionally, a detailed listing of subprovince alternatives and corresponding features is presented. Furthermore, the last portion of this attachment details the Supplemental Framework.

Development of Alternative Frameworks

The subprovince alternative frameworks were established to achieve the Hydrogeomorphic and Ecosystem planning objectives. In addition to establishing a range of possible restoration outcomes, framework scales, by subprovince, were created. The ecological framework scales are based on reduction or reversal of the net annual land loss rate. The scales are defined as follows:

- *No Action (Future Without Project):* The annual net land loss rate if no additional features are taken to restore coastal Louisiana = -10mi^2/yr
- *Reduce:* The annual net land loss rate is reduced to50 percent of the annual current net land loss rate = -5mi^2/yr
- *Maintain:* There is no net annual loss of land (land gain would equal land loss) = 0 mi^2/yr
- *Increase:* The rate of annual net land gain is 50 percent of the No Action annual net land loss rate = +5 mi^2/yr

Table 1 identifies the Framework Scales by subprovince.

Table 1
Framework Scales by Subprovince

	FWO [1]	Reduce [2]	Maintain [2]	Increase [2]
Subprovince 1	-806 ac/yr	+403 ac/yr	+806 ac/yr	+1,209 ac/yr
Subprovince 2	-2,291 ac/yr	+1,146 ac/yr	+2,291 ac/yr	+3,437 ac/yr
Subprovince 3	-2,842 ac/yr	+1,421 ac/yr	+2,842 ac/yr	+4,263 ac/yr
Subprovince 4	-461 ac/yr	--	+461 ac/yr	+692 ac/yr
Total	-6,400 ac/yr	+2,970 ac/yr	+6,400 ac/yr	+9,601 ac/yr
Total (mi^2/yr)	-10.0	+4.6	+10.0	+15.0

Notes:
1: Numbers for FWO (future without project) are an estimated loss rate, and are subject to change.
2: Numbers for "reduce," "maintain," and "increase" scales are the gross amount of acres restored and/or protected. For net acreage change in any subprovince, the FWO number should be subtracted from the gross acreage protected.

The goal of combining features into subprovince alternatives was to examine different approaches for meeting a specific scale. Thus, the alternative frameworks were intended to represent different hypotheses for ways to meet the various scales. Moreover, the alternatives needed to be distinct enough to provide for a real choice among them. This led to the development of conceptual frameworks and provided for the development of alternatives that are "significantly different." So as to not make the analysis of alternatives overly complex, the number of alternatives for each subprovince scale was limited to three, unless such a limit excluded a reasonable alternative or feature that would not otherwise be reviewed.

Subprovince Frameworks

Subprovince 1 = 10 Alternatives
Subprovince 2 = 10 Alternatives
Subprovince 3 = 5 Alternatives
Subprovince 4 = 7 Alternatives

Subprovinces 1 and 2

Subprovince 1 **(plate 1)** includes Lakes Pontchartrain and Maurepas and the surrounding marshes and swamps. The subprovince extends eastward to the Chandeleur Islands, from the Prairie Terrace on the north, and southward to the Mississippi River. Subprovince 2 **(plate 1)** extends from the Mississippi River on the northeast, to Bayou Lafourche on the west, and to the Gulf of Mexico on the south.

In the initial effort to develop alternatives for Subprovinces 1 and 2, it became evident that there could be three different approaches (or frameworks) for meeting any given scale. Because the fundamental restoration approach for the Deltaic Plain is freshwater and sediment

re-introduction, these three conceptual frameworks relate specifically to the design, operation, and ecosystem effects of re-introduction features. The following is a description of each conceptual framework, along with the rationale for its use:

Minimize Salinity Changes: Freshwater re-introductions affect salinity gradients and, therefore, can result in significant ecological changes. Many of the social and economic benefits currently provided by the ecosystem are based on the distribution of marsh types and salinity conditions that have prevailed for several decades. While the long-term goal of freshwater re-introductions is to ensure a healthy, productive, and sustainable coast, such features can change fisheries and wetland habitat types so that local harvesters and communities can no longer realize these benefits. The question then becomes whether it is possible to meet each framework scale in a way that minimizes such potential changes, while still providing for a sustainable coastal ecosystem. To answer this question, one alternative for each scale was developed in a way that seeks to minimize salinity changes. Alternatives consistent with this conceptual framework rely less on freshwater re-introduction and more on marsh creation using external sediment sources (including off-shore and riverine sources). Although the primary features for building marsh platforms are mechanical, limited freshwater re-introductions are included to help ensure the long-term sustainability of existing and restored wetlands. Additionally, the inclusion of freshwater re-introductions would provide an element of self-design, albeit to a relatively limited extent. This framework was applied throughout both subprovinces, but particularly in the upper portion of Subprovince 1, where salinity increases are already recognized as a threat to the ecosystem so reducing salinity was a goal of any alternative for the area.

Continuous Re-introduction (with Stage Variation): In coastal Louisiana, the existing freshwater re-introduction projects (such as Davis Pond and Caernarvon) are for the most part operated with a continuous (i.e., year-round) flow, with discharge volume varying according to river stages and ceasing when river stages are too low. The existing re-introduction projects are relatively small compared to the far larger projects being contemplated in the LCA process to reach the "maintain" and "increase" scales. It is likely that the same approach of year-round re-introduction of water would provide effects at the larger scale that are not apparent with the existing diversions. Moreover, given that the natural deltaic process has been massively disrupted, the existing projects still fall far short of meeting the freshwater, nutrient, and sediment needs of Subprovinces 1 and 2. By developing alternatives around a "continuous re-introduction" framework, the LCA process would be able to assess the potential benefits and costs of using more, and larger re-introductions, that operate year-round. This framework also allows for analysis of the water quality/hypoxia benefits that could be derived from maximum use of freshwater re-introduction.

Mimic Historic Hydrology: Alternatives under this conceptual framework are based on the assumption that historic hydrologic regimes (apart from river switching) in the Deltaic Plain province were characterized by numerous, smaller, seasonal freshwater inflows (from over-bank flow, small distributaries and/or minor crevasses) combined with relatively short-term episodes of large freshwater inflows due to major flood-induced crevasses. Alternatives designed under this framework tend to include numerous, smaller re-introductions combined with large re-introduction projects to be operated in periodic "pulsing" events. Consistent with this framework, the "increase" scale in Subprovince 2 includes the "Third Delta" (to mimic an

historic Bayou Lafourche flow), as well as the relocation of navigation on the Mississippi River (to allow for more dynamic deltaic processes at the mouth of the river). Where appropriate, alternatives under this framework also include sediment enrichment of re-introduction waters to mimic the historically higher sediment loads in the Mississippi River. In addition to testing whether mimicking historic hydrology would meet the various scales, this conceptual framework may also provide a way to help restore deltaic processes, while minimizing any potential impacts associated with the year-round re-introduction features discussed above.

Summary of Subprovince 1 and 2

Using these three frameworks would not result in alternatives that are totally different from each other. Indeed, certain features may be included under all or many alternatives for a particular subprovince (e.g., barrier islands in Subprovince 2). Such common elements are often included because they either represent a structural component needed to make an alternative complete or are viewed as being valuable under a variety of scenarios. Moreover, where appropriate and consistent with the given conceptual framework, features were assembled in a way that sought to spread potential benefits throughout each subprovince. For example, though much of the "reduce" scale in Subprovince 1 could potentially be addressed by features taken in the upper portion of the subprovince, the use of such features was limited for the sake of developing alternatives with greater balance and geographic completeness. Finally, in using these frameworks to develop alternatives, care has been taken to ensure that re-introduction projects would not divert too much river flow, which could have consequences for navigation and possibly other existing uses of the river. The same consideration applies to some Subprovince 3 alternatives, as well as to the combination of re-introduction alternatives for all three subprovinces.

Subprovince 3

Subprovince 3 **(plate 1)** encompasses the Terrebonne, Atchafalaya, and Tech-Vermilion Basins. The region extends from Bayou Lafourche on the east, to Freshwater Bayou Canal on the west, and north to the boundary of coastal wetlands.

Environmental and geologic conditions vary considerably across Subprovince 3. The western portion of the subprovince experiences lower subsidence rates than the eastern portion and has the benefit of large volumes of freshwater, sediments, and nutrients flowing down the Atchafalaya River, which results in ongoing deltaic growth. The eastern portion of the subprovince has a far higher land loss rate and has limited opportunities for freshwater re-introduction. The conceptual frameworks for Subprovince 3 reflect both the opportunities and the constraints facing wetland restoration in the area. Specifically, the frameworks represent different approaches to maximizing the use of potential and/or existing freshwater sources, while also restoring important geomorphic features. The conceptual frameworks for Subprovince 3 are:

Maximize Atchafalaya Flow: The ongoing deltaic land growth at the mouth of the Atchafalaya River and Wax Lake Outlet is both a rare source of new wetland acres in coastal Louisiana and a clear example of the benefits that can be derived from restoring deltaic

processes. Alternatives developed under this framework seek to increase, to the maximum extent possible, the ongoing land growth, while also redirecting Atchafalaya River waters to help nourish wetlands in the Terrebonne Basin. In addition to improving natural deltaic processes, alternatives under this framework would involve mechanical features (i.e., sediment delivery) to further expedite and increase land growth. Increased flows down Bayou Lafourche would also be assessed as a means for reducing loss rates in eastern Terrebonne Basin. Finally, as with the other conceptual frameworks for Subprovince 3 (discussed below), alternatives under this framework would include features designed to rehabilitate or maintain important geomorphic features, including barrier islands, land bridges, and gulf shorelines.

Land Building by Delta Development: Given the challenge of reintroducing significant amounts of freshwater, sediments, and nutrients to the eastern portion of Subprovince 3, it would take a massive effort to reestablish deltaic land growth in the area. The only feature potentially capable of this is the "Third Delta," an ambitious proposal to create a massive new distributary channel from the Mississippi River to both the Barataria and Terrebonne Basins. To assess the effects of such a feature, alternatives developed under this conceptual framework would center on implementation of the "Third Delta". While relying primarily on this new distributary channel, these alternatives would also include moderate, complementary efforts to increase Atchafalaya Delta development, move Atchafalaya River waters to the east, and restore critical geomorphic features.

Mississippi and Atchafalaya Flows: Alternatives developed under this conceptual framework represent a hybrid of the two former frameworks. Specifically, these alternatives would employ both the "Third Delta", as well as more extensive efforts to increase Atchafalaya Delta development and move Atchafalaya River waters to the east, while also maximizing efforts to rehabilitate and maintain critical geomorphic features.

Subprovince 4

Subprovince 4 **(plate 1)** extends from the western bank of the Freshwater Bayou Canal westward to the Louisiana/Texas border in Sabine Lake, and from the marsh areas just north of the Gulf Intracoastal Waterway, south to the Gulf of Mexico in Vermilion, Cameron, and Calcasieu Parishes.

Salinity control has been identified as the "keystone strategy" for Subprovince 4. The increased water demands of Texas have also threatened the freshwater inflows that reduce salinity advancement up the Sabine River. With the proposed enlargement of the subprovince's navigation channels, the potential for increases in salinity and losses of vegetative marshes rises. Specifically, the deepening of Calcasieu and Sabine Passes for navigation has been demonstrated to be the primary cause of increased salinity levels, which in turn have resulted in significant impacts to the area's wetland resources. Accordingly, the main conceptual frameworks for alternatives in Subprovince 4 represent different approaches to addressing the fundamental problem of increased salinities. The following is a description of the three conceptual frameworks:

Large-scale Salinity Control: The foundation of alternatives developed under this framework is large-scale salinity control structures (i.e., locks/gates) at Calcasieu Pass and Sabine Pass. Such structures would be designed and operated to improve the salinity increases caused by the deepening of these passes for navigation purposes. While not exactly restoring the historic dimensions of the passes, these structures would have the effect of restricting saltwater inflows, in the same general location that such restrictions existed in the past, with minimum impacts to navigation. Theoretically, implementation of such an alternative could allow for modification or removal of existing upstream salinity control features, thereby supporting the restoration of a more natural and less-managed hydrologic regime throughout the subprovince.

Perimeter Salinity Control: Alternatives developed under this conceptual framework are intended to reduce salinity impacts, while also avoiding any potential effects that locks/gates on the Calcasieu and Sabine Passes may have on navigation. Specifically, this group of alternatives would include small-scale salinity control measures around the perimeters of Calcasieu and Sabine Lakes, thereby reducing saltwater intrusion to adjacent wetlands and waterways. Such structures would be state-of-the-art, designed to minimize disruption of organism and material linkages. However, unlike the large-scale salinity control alternatives, a perimeter approach would likely not limit any increased salinity of the current ecological character and social and economic uses of the Calcasieu and Sabine Passes and Lakes. This alternative would incorporate and build upon existing perimeter control structures.

Freshwater Introduction Salinity Control: Alternatives developed under this conceptual framework rely less on structural salinity-blocking features and more on hydrologic modifications, to bring additional freshwater into the northern portion of the estuaries as the primary means for reducing salinities. Specifically, these alternatives would use culverts and other existing structures as conduits for increased flow of freshwater, which in turn would reduce salinity levels within the Calcasieu and Sabine estuaries. Freshwater introduction across LA Highway 82 in the Mermentau Basin would aide to reduce salinities in the Chenier subbasin. Such alternatives would be intended to aid in the restoration of more natural hydrologic regimes, while having the added benefit of minimizing potential adverse socio-economic impacts associated with the structural approaches considered in the first two frameworks, particularly with respect to the restriction of organism and material linkages and impacts to navigation.

Summary of Subprovince 4

As with the other LCA subprovinces, there are specific features that are common to many of the Subprovince 4 alternatives. For example, as recommended by some members of the National Technical Review Committee (NTRC), beneficial use of material dredged for navigation purposes is included in many Subprovince 4 alternatives. Excessive impoundment of water has been identified as major stressor of the wetlands. Thus, a number of alternatives include features to help reduce excessive water levels, in addition to allowing fresh water to flow southward to higher salinity areas, including the use of structures to improve freshwater flow across LA Highway 82. Finally, as with barrier islands to the east, gulf shoreline stabilization has been included throughout the alternatives in recognition of the critical function served by the Chenier Plain gulf barrier headland.

Features Requiring Further Study

The below features have the potential to significantly influence the coastal ecosystem, resources, or their sustainability and usability. Therefore, these features will be carried forward for further study in conjunction with the selection of a coastwide framework from the final array of coastwide frameworks. The features are as follows:

- Subprovinces 2 and 3 - Third Delta Conveyance Channel Study.
- Subprovince 3 - Modify Old River Control Structure (ORCS) operational scheme to benefit coastal wetlands.
- Subprovinces 1 and 2 - Mississippi Delta Management Study.
- Subprovince 1 - Mississippi River-Gulf Outlet Modification Closure.
- Subprovince 4 - Chenier Plain Freshwater Management and Allocation Reassessment.

SPECIFIC ALTERNATIVES BY SUBPROVINCE

SUBPROVINCE 1 - MISSISSIPPI EAST (BRETON/PONTCHARTRAIN)

This section addresses alternatives for Subprovince 1 with the following scales: (1) reduce, (2) maintain, and (3) increase the amount of wetlands in the subprovince area. There is a total of 10 alternatives for this subprovince: three "reduce" (R); three "maintain" (M); three "increase" (E); and No Action (N).

Subprovince 1	R1	R2	R3	M1	M2	M3	E1	E2	E3	N1
15,000 cfs diversion at American / California Bay				X			x	x		
110,000 cfs diversion (div.) at American / California Bay with sediment enrichment			x		x					x
250,000 cfs div. at American / California Bay with sediment enrichment						x			x	
12,000 cfs div. at Bayou Lamoque		x	x		x	x		x	x	x
5,000 cfs div. at Bonnet Carre Spillway	x	x		X						
10,000 cfs div. at Bonnet Carre Spillway						x	x	x	x	
200,000 cfs div. at Caernarvon w/ sediment enrichment								x		
1,000 cfs div. at Convent / Blind River			x			x			x	
5,000 cfs div. at Convent / Blind River		x			x		x			x
10,000 cfs div. at Convent / Blind River								x		
15,000 cfs div. at Fort St. Philip			x	x			x			
26,000 cfs div. at Fort St. Philip w/ sediment enrichment						x				
52,000 cfs div. at Fort St. Philip w/ sediment enrichment									x	
1,000 cfs div. at Hope Canal	x	x	x	x	x	x			x	x
1,000 cfs div at Reserve Relief Canal									x	
6,000 cfs div. at White's Ditch							x			
10,000 cfs div. at White's Ditch		x	x		x	x			x	x
Sediment delivery by pipeline at American/ California Bay				x			x		x	
Sediment delivery via pipeline at Central Wetlands	x			x			x			
Sediment delivery via pipeline at Fort St. Philip				x			x			
Sediment delivery via pipeline at Golden Triangle							x			
Sediment delivery via pipeline at Labranche	x			x			x			x
Sediment delivery via pipeline at Quarantine Bay	x						x			
Authorized opportunistic use of the Bonnet Carre Spillway.										x
Increase Amite River influence by gapping dredged material banks on diversion canals.										x
Marsh nourishment on the New Orleans East land bridge.										x
Mississippi River Delta Management Study.										x
Mississippi River Gulf Outlet Environmental Features and Salinity Control Study.					x		x			x
Reauthorization of the Caernarvon freshwater diversion. (optimize for marsh creation).										x
Rehabilitate Violet Siphon and post authorization change for the diversion. of water through Inner Harbor Navigation Canal for enhanced influence into Central Wetlands.										x

Note: Gross rates of restored/ protected wetlands: R = Reduce, 406 ac/yr; M = Maintain, 806 ac/yr; E =Increase, -1,209 ac/yr; Scales: 1 = Minimize salinity change; 2 = Continuous reintroduction; 3 = Mimic historic hydrology. Column N1 represents the Supplemental Framework.

Subprovince 1 - Reduce (cut loss by 406 acres per year (ac/yr))

Subprovince 1 - Alternative R1 (Minimize salinity change) – plate 2

Subprovince 1 – Alternative R1 (Minimize salinity change)
1. 1,000 cubic feet per second (cfs) diversion at Hope Canal
2. 5,000 cfs diversion at Bonnet Carre Spillway
3. Sediment delivery via pipeline at Labranche
4. Sediment delivery via pipeline at Central Wetlands
5. Sediment delivery via pipeline at Quarantine Bay

- **1,000 cfs diversion at Hope Canal**. This feature provides for a 1,000 cubic feet per second (cfs) diversion at Hope Canal - 1,000 cfs at 50 percent duration river stage, annual diversion corresponds to annual river stage hydrograph, controlled structure (current U.S. Environmental Protection Agency (USEPA) project based on a single box culvert).
- **5,000 cfs diversion at Bonnet Carre spillway**. This feature includes a 5,000 cfs diversion at the Bonnet Carre Spillway with east and west branches into wetlands. 5,000 cfs at 50 percent duration river stage diverted through the existing flood control structure, redirected through the guide levees into adjacent wetlands, annual diversion corresponds to annual river stage hydrograph, with controlled structure(s). At the 5,000 cfs level, the feature may have only one branch.
- **Sediment delivery via pipeline at Labranche Wetlands**. This feature provides for sediment delivery via sediment mined from the Mississippi River. The feature would provide for a dredging volume corresponding to a net yield of approximately 72 wetland acres per year.
- **Sediment delivery via pipeline at Central Wetlands**. This feature provides for sediment delivery via sediment mined from the Mississippi River placed in the Central wetlands adjacent to the Mississippi River Gulf Outlet (MRGO) and Violet canal. The feature would provide for a dredging volume corresponding to a net yield of approximately 92 wetland acres per year.
- **Sediment delivery via pipeline at Quarantine Bay**. This feature provides for sediment delivery via programmatic sediment mining from the Mississippi River. The feature would provide for a dredging volume corresponding to a net yield of approximately 210 wetland acres per year.

Subprovince 1 - Alternative R2 (Continuous Re-introduction) – plate 3

Subprovince 1 - Alternative R2 (Continuous re-introduction)
1. 5,000 cfs diversion at Convent / Blind River
2. 1,000 cfs diversion at Hope Canal
3. 5,000 cfs diversion at Bonnet Carre Spillway
4. 10,000 cfs diversion at White's Ditch
5. 12,000 cfs diversion at Bayou Lamoque

- **5,000 cfs diversion at Convent / Blind River**. This feature provides for 5,000 cfs diversion at 50 percent duration river stage diverted into the Blind River headwater, annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Hope Canal**. This feature provides for a 1,000 cfs diversion at Hope Canal - 1,000 cfs at 50 percent duration river stage, annual diversion corresponds to annual river stage hydrograph, controlled structure (current USEPA project based on a single box culvert).
- **5,000 cfs diversion at Bonnet Carre spillway**. This feature includes a 5,000 cfs diversion at the Bonnet Carre Spillway with east and west branches into wetlands. 5,000 cfs at 50 percent duration river stage diverted through the existing flood control structure, redirected through the guide levees into adjacent wetlands, annual diversion corresponds to annual river stage hydrograph, with controlled structure(s). At the 5,000 cfs level, the feature may have only one branch.
- **10,000 cfs diversion at White's Ditch**. This feature provides for a 10,000 cfs at 50 percent duration river stage into central River aux Chene area, annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **12,000 cfs diversion at Bayou Lamoque**. This feature provides for refurbishment and operation of the existing Bayou Lamoque diversion structures 12,000 cfs - 12,000 cfs at maximum river stage, annual diversion corresponds to annual river stage hydrograph, controlled structures require mechanical rehabilitation, and operational security modifications.

Subprovince 1 - Alternative R3 (Mimic historic Hydrology) – plate 4

Subprovince 1 - Alternative R3 (Mimic Historic Hydrology)
1. 1,000 cfs diversion at Hope Canal
2. 1,000 cfs diversion at Convent / Blind River
3. 10,000 cfs diversion at White's Ditch
4. 12,000 cfs diversion at Bayou Lamoque
5. 110,000 cfs diversion at N American / California Bay with sediment enrichment
6. 15,000 cfs diversion at Fort St. Philip

- **1,000 cfs diversion at Hope Canal**. This feature provides for a 1,000 cfs diversion at Hope Canal - 1,000 cfs at 50 percent duration river stage, annual diversion corresponds to annual river stage hydrograph, controlled structure (current USEPA project based on a single box culvert).

- **1,000 cfs diversion at Convent / Blind River**. This feature provides for 1,000 cfs diversion at 50 percent duration river stage diverted into the Blind River headwater, annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **10,000 cfs diversion at White's Ditch**. This feature provides for a 10,000 cfs diversion at 50 percent duration river stage into central River aux Chene area, annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **12,000 cfs diversion at Bayou Lamoque**. This feature provides for refurbishment and operation of the existing Bayou Lamoque diversion structures 12,000 cfs. 12,000 cfs at maximum river stage, annual diversion corresponds to annual river stage hydrograph, controlled structures require mechanical rehabilitation and operational security modifications.
- **110,000 cfs diversion at Northern American / California Bay with sediment enrichment**. This feature provides for a 110,000 cfs diversion at 50 percent duration river stage, annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion. Sediment enrichment assumes use of 27-inch dredge at capacity for three months. Three month yield = 4,405,000 cubic yards (yd^3) at an average depth of 10 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 245 ppm additional sediment in the diversion at 100,000 cfs
- **15,000 cfs diversion at Fort St. Philip**. This feature provides for a 15,000 cfs diversion at 50 percent duration river stage into area north east of fort, annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.

Subprovince 1 - Maintain (cut loss by 806 ac/yr)

Subprovince 1 - Alternative M1 (Minimize salinity change) – plate 5

Subprovince 1 - Alternative M1 (Minimize salinity change)
1. 1,000 cfs diversion at Hope Canal
2. 5,000 cfs diversion at Bonnet Carre Spillway
3. Sediment delivery via pipeline at Labranche
4. Sediment delivery via pipeline at Central Wetlands
5. Sediment delivery via pipeline at American / California Bay
6. 15,000 cfs diversion at American / California Bay
7. Sediment delivery via pipeline at Fort St. Philip
8. 15,000 cfs diversion at Fort St. Philip

- **1,000 cfs diversion at Hope Canal**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage, annual diversion corresponds to annual river stage hydrograph, controlled structure (current EPA project based on single box culvert).
- **5,000 cfs diversion at Bonnet Carre spillway**. This feature includes a 5,000 cfs diversion at the Bonnet Carre Spillway with east and west branches into wetlands. 5,000 cfs at 50 percent duration river stage diverted through the existing flood control structure, redirected through the guide levees into adjacent wetlands, annual diversion corresponds to annual river stage hydrograph, with controlled structure(s). At the 5,000 cfs level, the feature may have only one branch.

- **Sediment delivery via pipeline at Labranche Wetlands**. This feature provides for sediment delivery via sediment mined from the Mississippi River. The required dredging volume would correspond to a net yield of approximately 72 wetland acres per year.
- **Sediment delivery via pipeline at Central Wetlands**. This feature provides for sediment delivery via sediment mined from the Mississippi River that would be placed in the Central wetlands adjacent to the MRGO and Violet canal. The required dredging volume corresponding to a net yield of approximately 92 wetland acres per year.
- **Sediment delivery via pipeline at American / California Bay**. This feature provides for sediment delivery via programmatic sediment mining from the Mississippi River. The required dredging volume corresponding to a net yield of approximately 432 wetland acres per year.
- **15,000 cfs diversion at American / California Bay**. This feature provides for a 15,000 cfs diversion at 50 percent duration river stage, annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.
- **Sediment delivery via pipeline at Fort St. Philip**. This feature provides for sediment delivery via programmatic sediment mining from the Mississippi River, with the required dredging volume corresponding to a net yield of approximately 104 wetland acres per year.
- **15,000 cfs diversion at Fort St. Philip**. This feature provides for a 15,000 cfs diversion at 50 percent duration river stage into area north east of the fort. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.

Subprovince 1 - Alternative M2 (Continuous Re-introduction) – plate 6

Subprovince 1 - Alternative M2 (Continuous re-introduction)
1. 5,000 cfs diversion at Convent / Blind River
2. 1,000 cfs diversion at Hope Canal
3. 10,000 cfs diversion at White's Ditch
4. 110,000 cfs diversion at American / California Bay with sediment enrichment
5. 12,000 cfs diversion at Bayou Lamoque
6. Mississippi River Gulf Outlet Environmental Features and Salinity Control Study

- **5,000 cfs diversion at Convent / Blind River**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into the Blind River headwater. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Hope Canal**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage. Annual diversion corresponds to annual river stage hydrograph, controlled structure (current EPA project based on single box culvert).
- **10,000 cfs diversion at White's Ditch**. This feature provides for a 10,000 cfs diversion at 50 percent duration river stage into central Riv aux Chene area. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **110,000 cfs diversion at American / California Bay with sediment enrichment**. This feature provides for a 110,000 cfs diversion at 50 percent duration river stage. Annual diversion corresponds to available river stage, uncontrolled diversion. Sediment enrichment assumes use of 24-inch dredge at capacity for three months. Three month yield =2,727, 000 yd^3 at an average depth of 10 feet with 50 percent compaction and 80

percent retention. This corresponds to approximately 138-ppm additional sediment in the diversion at 110,000 cfs.

- **12,000 cfs diversion at Bayou Lamoque**. This feature provides for the refurbishment and operation of the existing Bayou Lamoque diversion structures 12,000 cfs - 12,000 cfs at maximum river stage, annual diversion corresponds to annual river stage hydrograph, controlled structures require mechanical rehabilitation and operational security modifications.
- **Mississippi River Gulf Outlet Environmental Features and Salinity Control Study.** This restoration feature involves the implementation of the environmental restoration projects contained in the MRGO Study. In response to public concerns, environmental affects and national economic development considerations, an ongoing study is re-evaluating the viability of operation and maintenance of this project. This study would also recommend various environmental restoration projects that would reduce saltwater intrusion into Lake Pontchartrain, the Biloxi marshes, the Central Wetlands, and the Golden Triangle marshes, which has degraded large expanses of freshwater marshes and accelerated habitat switching in these areas.

Subprovince 1 - Alternative M3 (Mimic historic hydrology) – plate 7

Subprovince 1 - Alternative M3 (Mimic Historic Hydrology)
1. 1,000 cfs diversion at Convent / Blind River
2. 1,000 cfs diversion at Hope Canal
3. 10,000 cfs diversion at Bonnet Carre Spillway
4. 10,000 cfs diversion at White's Ditch
5. 250,000 cfs diversion at American / California Bay with sediment enrichment
6. 12,000 cfs diversion at Bayou Lamoque
7. 26,000 cfs diversion at Fort St. Philip with sediment enrichment

- **1,000 cfs diversion at Convent / Blind River**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into the Blind River headwater. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Hope Canal**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage. Annual diversion corresponds to annual river stage hydrograph, controlled structure (current EPA project based on single box culvert).
- **10,000 cfs diversion at Bonnet Carre spillway**. This feature consists of a 10,000 cfs diversion with east and west branches into wetlands - 10,000 cfs at 50 percent duration river stage diverted through the existing flood control structure – redirected through the guide levees into adjacent wetlands. Annual diversion corresponds to annual river stage hydrograph, with controlled structures.
- **10,000 cfs diversion at White's Ditch**. This feature provides for a 10,000 cfs diversion at 50 percent duration river stage into central River aux Chene area. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **250,000 cfs diversion at Northern American / California Bay with sediment enrichment**. This feature provides for a 250,000 cfs diversion at 70 percent duration river stage, annual diversion corresponds to annual river stage hydrograph, uncontrolled

diversion. Sediment enrichment assumes use of 30-inch dredge at capacity for three months. Three month yield = 6,293, 000 yd^3 at an average depth of 10 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 140-ppm additional sediment in the diversion at 250,000 cfs.

- **12,000 cfs diversion at Bayou Lamoque**. This feature provides for refurbishment and operation of the existing Bayou Lamoque diversion structures 12,000 cfs - 12,000 cfs at maximum river stage. Annual diversion corresponds to annual river stage hydrograph, controlled structures require mechanical rehabilitation and operational security modifications.
- **26,000 cfs diversion at Fort St. Philip with sediment enrichment**. This feature provides for a 26,000 cfs diversion at 50 percent duration river stage into area north east of the fort. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion. Sediment enrichment assumes use of 16-inch dredge at capacity for three months. Three month yield = 1,154, 000 yd^3 at an average depth of 7.5 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 247 ppm additional sediment in the diversion at 26,000 cfs

Subprovince 1 - Increase (cut loss by 1,209 ac/yr)

Subprovince 1 - Alternative E1 (Minimize salinity change) – plate 8

Subprovince 1 - Alternative E1 (Minimize salinity change)
1. 5,000 cfs diversion at Convent / Blind River
2. 10,000 cfs diversion at Bonnet Carre Spillway
3. Sediment delivery via pipeline at Labranche
4. Sediment delivery via pipeline at Golden Triangle
5. Sediment delivery via pipeline at Central Wetlands
6. 6,000 cfs diversion at White's Ditch
7. Sediment delivery via pipeline at American / California Bay
8. Sediment delivery via pipeline at Quarantine Bay
9. Sediment delivery via pipeline at Fort St. Philip
10. 15,000 cfs diversion at American / California Bay
11. 15,000 cfs diversion at Fort St. Philip
12. Mississippi River Gulf Outlet Environmental Features and Salinity Control Study

- **5,000 cfs diversion at Convent / Blind River**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into the Blind River headwater. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **10,000 cfs diversion at Bonnet Carre spillway**. This feature consists of a 10,000 cfs diversion with east and west branches into wetlands - 10,000 cfs at 50 percent duration river stage diverted through the existing flood control structure – redirected through the guide levees into adjacent wetlands. Annual diversion corresponds to annual river stage hydrograph, with controlled structures.

- **Sediment delivery via pipeline at Labranche Wetlands**. This feature provides for sediment delivery via sediment mined from the Mississippi River. Required dredging volume corresponding to a net yield of approximately 72 wetland acres per year.
- **Sediment delivery via pipeline at Golden Triangle Area**. This feature provides for sediment delivery via sediment mined from the Mississippi River placed in the area formed by the confluence of the MRGO and Gulf Intracoastal Waterway (GIWW) and Lake Borgne. Required dredging volume corresponding to a net yield of approximately 72 wetland acres per year.
- **Sediment delivery via pipeline at Central Wetlands**. This feature provides for sediment delivery via sediment mined from the Mississippi River placed in the Central wetlands adjacent to the MRGO and Violet canal. Required dredging volume corresponding to a net yield of approximately 92 wetland acres per year.
- **6,000 cfs diversion at White's Ditch**. This feature provides for a 6,000 cfs diversion at 50 percent duration river stage into central River aux Chene area. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **Sediment delivery via pipeline at American / California Bay**. This feature provides for sediment delivery via programmatic sediment mining from the Mississippi River, with the required dredging volume corresponding to a net yield of approximately 432 wetland acres per year.
- **Sediment delivery via pipeline at Quarantine Bay**. This feature provides for sediment delivery via programmatic sediment mining from the Mississippi River, with the required dredging volume corresponding to a net yield of approximately 391 wetland acres per year.
- **Sediment delivery via pipeline at Fort St. Philip**. This feature provides for sediment delivery via programmatic sediment mining from the Mississippi River. Required dredge volume corresponding to a net yield of approximately 104 wetland acres per year.
- **15,000 cfs diversion at American / California Bay**. This feature provides for a 15,000 cfs diversion at 50 percent duration river stage. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.
- **15,000 cfs diversion at Fort St. Philip**. This feature provides for a 15,000 cfs diversion at 50 percent duration river stage into area north east of fort. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.
- **Mississippi River Gulf Outlet Environmental Features and Salinity Control Study.** This restoration feature involves the implementation of the environmental restoration projects contained in the MRGO Study. In response to public concerns, environmental affects and national economic development considerations, an ongoing study is re-evaluating the viability of operation and maintenance of this project. This study would also recommend various environmental restoration projects that would reduce saltwater intrusion into Lake Pontchartrain, the Biloxi marshes, the Central Wetlands, and the Golden Triangle marshes, which has degraded large expanses of freshwater marshes and accelerated habitat switching in these areas.

Subprovince 1 - Alternative E2 (Continuous Re-introduction) – plate 9

Subprovince 1 - Alternative E2 (Continuous re-introduction)
1. 10,000 cfs diversion at Convent / Blind River
2. 10,000 cfs diversion at Bonnet Carre Spillway
3. 200,000 cfs diversion at Caernarvon with sediment enrichment
4. 15,000 cfs diversion at American / California Bay
5. 12,000 cfs diversion at Bayou Lamoque

- **10,000 cfs diversion at Convent / Blind River**. This feature provides for a 10,000 cfs diversion at 50 percent duration river stage diverted into the Blind River headwater. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **10,000 cfs diversion at Bonnet Carre spillway**. This feature consists of a 10,000 cfs diversion with east and west branches into wetlands - 10,000 cfs at 50 percent duration river stage diverted through the existing flood control structure – redirected through the guide levees into adjacent wetlands. Annual diversion corresponds to annual river stage hydrograph, with controlled structures.
- **200,000 cfs Delta building diversion at Caernarvon with sediment enrichment**. This feature provides for a 200,000 cfs diversion at 70 percent duration river stage channeled into northeastern Breton basin. Annual diversion corresponds to available river stage, controlled structure.
- **15,000 cfs diversion at American / California Bay**. This feature provides for a 15,000 cfs diversion at 50 percent duration river stage. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.
- **12,000 cfs diversion at Bayou Lamoque**. This feature provides for refurbishment and operation of the existing Bayou Lamoque diversion structures 12,000 cfs - 12,000 cfs at maximum river stage. Annual diversion corresponds to annual river stage hydrograph, controlled structures require mechanical rehabilitation and operational security modifications.

Subprovince 1 - Alternative E3 (Mimic historic hydrology) – plate 10

Subprovince 1 - Alternative E3 (Mimic Historic Hydrology)
1. 1,000 cfs diversion at Convent / Blind River
2. 1,000 cfs diversion at Hope Canal
3. 1,000 cfs diversion at Reserve Relief Canal
4. 10,000 cfs diversion at Bonnet Carre Spillway
5. 10,000 cfs diversion at White's Ditch
6. 250,000 cfs diversion at American / California Bay with sediment enrichment
7. 12,000 cfs diversion at Bayou Lamoque
8. 52,000 cfs diversion at Fort St. Philip with sediment enrichment
9. Sediment delivery by pipeline at American / California Bay

- **1,000 cfs diversion at Convent / Blind River**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into the Blind River headwater. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Hope Canal**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage. Annual diversion corresponds to annual river stage hydrograph, controlled structure (current EPA project based on single box culvert).
- **1,000 cfs diversion at Reserve Relief Canal**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into the southeastern Maurepas swamp. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **10,000 cfs diversion at Bonnet Carre spillway**. This feature consists of a 10,000 cfs diversion with east and west branches into wetlands - 10,000 cfs at 50 percent duration river stage diverted through the existing flood control structure – redirected through the guide levees into adjacent wetlands, annual diversion corresponds to annual river stage hydrograph, with controlled structures.
- **10,000 cfs diversion at White's Ditch**. This feature provides for a 10,000 cfs diversion at 50 percent duration river stage into central River aux Chene area. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **250,000 cfs diversion at American / California Bay with sediment enrichment.** This feature provides for a 250,000 cfs diversion at 70 percent duration river stage, annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion. Sediment enrichment assumes use of 30-inch dredge at capacity for three months. Three month yield = 6,293, 000 yd^3 at an average depth of 10 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 140 ppm additional sediment in the diversion at 250,000 cfs
- **12,000 cfs diversion at Bayou Lamoque**. This feature provides for refurbishment and operation of the existing Bayou Lamoque diversion structures 12,000 cfs - 12,000 cfs at maximum river stage. Annual diversion corresponds to annual river stage hydrograph, controlled structures require mechanical rehabilitation and operational security modifications.
- **52,000 cfs diversion at Fort St. Philip with sediment enrichment**. This feature provides for a 52,000 cfs diversion at 50 percent duration river stage into area north east of fort, annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion. Sediment enrichment assumes use of 16-inch dredge at capacity for three months. Three month yield = 1,154, 000 yd^3 at an average depth of 7.5 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 123-ppm additional sediment in the diversion at 52,000 cfs.
- **Sediment delivery via pipeline at American / California Bay**. This feature provides for sediment delivery via programmatic sediment mining from the Mississippi River, with the required dredging volume corresponding to a net yield of approximately 432 wetland acres per year.

SUBPROVINCE 2 -MISSISSIPPI WEST (BARATARIA)

This section would address alternatives for Subprovince two with the following scales: (1) reduce, (2) maintain and (3) increase the amount of wetlands in the Subprovince area. There is a total of ten alternatives for this subprovince: three "reduce" (R); three "maintain" (M); three "increase"(E); and No Action (N).

Subprovince 2	R1	R2	R3	M1	M2	M3	E1	E2	E3	N1
5,000 cfs diversion (div.) at Bastian Bay/Buras			x							
130,000 cfs div. at Bastian Bay/Buras		x								
120,000 cfs div. near Bayou Lafourche									x	
60,000 cfs div. at Boothville w/ sediment enrichment.										x
1,000 cfs div. at Donaldsonville		x	x		x	x				x
5,000 cfs div. at Donaldsonville w/ sediment enrichment								x		
1,000 cfs div. at Edgard		x	x		x	x				x
5,000 cfs div. at Edgard w/ sediment enrichment	x							x		
5,000 cfs div. at Empire			x							
90,000 cfs div. at Empire								x		
5,000 cfs div. at Fort Jackson			x							
60,000 cfs div. At Fort Jackson	x			x						
60,000 cfs div. at Fort Jackson w/ sediment enrichment						x	x	x		
90,000 cfs div. at Fort Jackson w/ sediment enrichment									x	
150,000 cfs div. at Fort Jackson w/ sediment enrichment					x					
1,000 cfs div. at Lac des Allemands		x			x	x				x
5,000 cfs div. at Lac des Allemands w/ sediment enrichment				x			x	x	x	
5,000 cfs div. at Myrtle Grove	x		x	x			x			x
15,000 cfs div. at Myrtle Grove		x								
38,000 cfs div. at Myrtle Grove w/ sediment enrichment					x					
75,000 cfs div. at Myrtle Grove w/ sediment enrichment						x				
150,000 cfs div. at Myrtle Grove w/ sediment enrichment								x		
5,000 cfs div at Oakville			x							
1,000 cfs div. at Pikes Peak		x	x		x	x				x
5,000 cfs div. at Pikes Peak w/ sediment enrichment								x		
5,000 cfs div. at Port Sulphur			x							
Barrier Island restoration at Barataria Shoreline	x	x	x	x	x	x	x	x	x	x
Marsh creation at Wetland Creation and Restoration feasibility study sites	x			x			x		x	x
Mississippi River Delta Management Study.										x
Reauthorization of Davis Pond.										x
Relocation of Deep Draft Navigation Channel							x		x	
Sediment delivery via pipeline at Bastian Bay / Buras				x			x			
Sediment delivery via pipeline at Empire			x	x			x			
Sediment delivery via pipeline at Main Pass (Head of Passes)				x			x			
Sediment delivery via pipeline at Myrtle Grove	x			x			x			x
Third Delta Study										x

Note: Gross rates of restored/ protected wetlands: R = Reduce 1,146 ac/yr; M = Maintain, 2,291 ac/yr ; E = Increase, 3,436 ac/yr; Scales: 1 = Minimize salinity change; 2 = Continuous reintroduction; 3 = Mimic historic hydrology. Column N1 represents the Supplemental Framework.

Subprovince 2 - Reduce (cut loss by 1,146 ac/yr.)

Subprovince 2 - Alternative R1 (Minimize salinity change) – plate 11

Subprovince 2 - Alternative R1 (Minimize salinity change)
1. 5,000 cfs diversion at Edgard with sediment enrichment
2. Sediment via pipeline at Myrtle Grove
3. 5,000 cfs diversion at Myrtle Grove
4. Marsh creation at Wetland Creation and Restoration feasibility study sites
5. Barrier Islands restoration at Barataria Shoreline
6. 60,000 cfs diversion at Fort Jackson

- **5,000 cfs diversion at Edgard with sediment enrichment**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands through Bayou Fortier. Annual diversion corresponds to annual river stage hydrograph, controlled structure. Sediment enrichment assumes use of 12-inch dredge for three months. Discharge of effluent up stream of the diversion intake would allow the capture of silts and very fine sands only. This would result in capture of approximately 30 percent of the total dredge effluent (6,989 yd^3 / day)
- **Sediment delivery via pipeline at Myrtle Grove**. This feature provides for sediment delivery via sediment mined from Mississippi River. Required dredging volume corresponding to a net yield of approximately 29 wetland acres per year.
- **5,000 cfs diversion at Myrtle Grove**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into the Bayou Dupont area. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **Marsh creation at Wetland Creation and Restoration Feasibility Study sites**. Sediment mined from offshore borrow sites placed in the sites along Bayou Lafourche. Required dredging volume corresponding to a net yield of approximately 360 wetland acres per year.
- **Barrier Island restoration at Barataria Shoreline**. Mining of offshore sediment sources to reestablish barrier islands. Based on designs developed in the LCA Barrier Island Restoration study. Option assumes a 3,000-foot island width footprint.
- **60,000 cfs diversion at Fort Jackson**. This feature provides for a 60,000 cfs diversion at 50 percent duration river stage into the Yellow Cotton / Hospital Bay area. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.

Subprovince 2 - Alternative R2 (Continuous Re-introduction) – plate 12

Subprovince 2 - Alternative R2 (Continuous Re-introduction)
1. 1,000 cfs diversion at Lac des Allemands
2. 1,000 cfs diversion at Donaldsonville
3. 1,000 cfs diversion at Pikes Peak
4. 1,000 cfs diversion at Edgard
5. 15,000 cfs diversion at Myrtle Grove
6. 130,000 cfs diversion at Bastian Bay/Buras
7. Barrier Island restoration at Barataria Shoreline

- **1,000 cfs diversion at Lac des Allemands**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands through Bayou Becnel. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Donaldsonville**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into upper Bayou Verret. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Pikes Peak**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Bayou Chevreuil. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Edgard**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands through Bayou Fortier. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **15,000 cfs diversion at Myrtle Grove**. This feature provides for a 15,000 cfs diversion at 50 percent duration river stage diverted into the Bayou Dupont area. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **130,000 cfs diversion at Bastian Bay / Buras**. This feature provides for a 130,000 cfs diversion at 50 percent duration river stage into Bastian Bay. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.
- **Barrier Island restoration at Barataria Shoreline**. Mining of offshore sediment sources to reestablish barrier islands. Based on designs developed in the LCA Barrier Island Restoration study. Option assumes a 1,500-foot island width footprint.

Subprovince 2 - Alternative R3 (Mimic historic hydrology) – plate 13

Subprovince 2 - Alternative R3 (Mimic Historic Hydrology)
1. 1,000 cfs diversion at Donaldsonville
2. 1,000 cfs diversion at Pikes Peak
3. 1,000 cfs diversion at Edgard
4. 5,000 cfs diversion at Oakville
5. 5,000 cfs diversion at Myrtle Grove
6. 5,000 cfs diversion at Port Sulphur
7. 5,000 cfs diversion at Empire
8. 5,000 cfs diversion at Bastian Bay/Buras
9. 5,000 cfs diversion at Fort Jackson
10. Sediment delivery via pipeline at Empire
11. Barrier Island restoration at Barataria Shoreline

- **1,000 cfs diversion at Donaldsonville**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into upper Bayou Verret. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Pikes Peak**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Bayou Chevreuil. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Edgard**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands through Bayou Fortier. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **5,000 cfs diversion at Oakville**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into the Bayou Concession. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **5,000 cfs diversion at Myrtle Grove**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into the Bayou Dupont area four out of five years. Operate at 150,000 cfs every fifth year. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **5,000 cfs diversion at Port Sulphur**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into the Freeport Sulphur canal. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **5,000 cfs diversion at Empire**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into Bay Adams. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **5,000 cfs diversion at Bastian Bay / Buras**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into the open wetlands. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.
- **5,000 cfs diversion at Fort Jackson**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into the Yellow Cotton / Hospital Bay area. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.
- **Sediment delivery via pipeline at Empire**. This feature provides for sediment delivery via sediment mined from the Mississippi River placed in Bay Adams. Required dredge volume corresponding to a net yield of approximately 115 wetland acres per year.

- **Barrier Island restoration at Barataria Shoreline**. Mining of offshore sediment sources to reestablish barrier islands. Based on designs developed in the LCA Barrier Island Restoration study. Option assumes a 3,000-foot island width footprint.

Subprovince 2 -Maintain (cut loss by 2,291 ac/yr.)

Subprovince 2 - Alternative M1 (Minimize salinity change) – plate 14

Subprovince 2 - Alternative M1 (Minimize salinity change)
1. 5,000 cfs diversion at Lac des Allemands with sediment enrichment
2. Sediment delivery via pipeline at Myrtle Grove
3. 5,000 cfs diversion at Myrtle Grove
4. Barrier Island restoration at Barataria Shoreline
5. 60,000 cfs diversion at Fort Jackson
6. Sediment delivery via pipeline at Empire
7. Sediment delivery via pipeline at Bastian Bay
8. Sediment delivery via pipeline at Main Pass (Head of Passes)
9. Marsh Creation at Wetland Creation and Restoration feasibility study sites

- **5,000 cfs diversion at Lac des Allemands with sediment enrichment**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands. Annual diversion corresponds to annual river stage hydrograph, controlled structure. Sediment enrichment assumes use of 12-inchdredge for three months. Discharge of effluent up stream of the diversion intake would allow the capture of silts and very fine sands only. This would result in capture of approximately 30 percent of the total dredge effluent (6,989 yd^3 / day).
- **Sediment delivery via pipeline at Myrtle Grove**. This feature provides for sediment delivery via sediment mined from the Mississippi River. Required dredging volume corresponding to a net yield of approximately 130 wetland acres per year.
- **5,000 cfs diversion at Myrtle Grove**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into the Bayou Dupont area. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **Barrier Island restoration at Barataria Shoreline**. Mining of offshore sediment sources to reestablish barrier islands. Based on designs developed in the LCA Barrier Island Restoration study. Option assumes a 3,000-foot island width footprint.
- **60,000 cfs diversion at Fort Jackson**. This feature provides for a 60,000 cfs diversion at 50 percent duration river stage into the Yellow Cotton / Hospital Bay area. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.
- **Sediment delivery via pipeline at Empire**. This feature provides for sediment delivery via sediment mined from Mississippi River placed in Bay Adams. Required dredging volume corresponding to a net yield of approximately 115 wetland acres per year.
- **Sediment delivery via pipeline at Bastian Bay / Buras**. This feature provides for sediment delivery via sediment mined from the Mississippi River placed in Bastian Bay.

Required dredging volume corresponding to a net yield of approximately 48 wetland acres per year.

- **Sediment delivery via pipeline at Main Pass (Head of Passes).** This feature provides for sediment delivery via programmatic sediment mining from the Mississippi River utilizing a Sediment Trap above the Head of Passes. Estimated dredging volume nine million cubic yards per year corresponding to a net yield of approximately 1,017 wetland acres per year.
- **Marsh creation at Wetland Creation and Restoration Feasibility Study sites**. This feature provides for sediment delivery via sediment mined from offshore borrow sites placed in the sites along Bayou Lafourche, required dredging volume corresponding to a net yield of approximately 180 wetland acres per year.

Subprovince 2 - Alternative M2 (Continuous Re-introduction) – plate 15

Subprovince 2 - Alternative M2 (Continuous Re-introduction)
1. 1,000 cfs diversion at Lac des Allemands
2. 1,000 cfs diversion at Donaldsonville
3. 1,000 cfs diversion at Pikes Peak
4. 1,000 cfs diversion at Edgard
5. 38,000 cfs diversion at Myrtle Grove with sediment enrichment
6. 150,000 cfs diversion at Fort Jackson with sediment enrichment
7. Barrier Island restoration at Barataria Shoreline

- **1,000 cfs diversion at Lac des Allemands**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands through Bayou Becnel. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Donaldsonville**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into upper Bayou Verret. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Pikes Peak**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Bayou Chevreuil. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Edgard**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands through Bayou Fortier. Annual diversion corresponds to annual river stage hydrograph, controlled structure
- **38,000 cfs diversion at Myrtle Grove with sediment enrichment**. This feature provides for a 38,000 cfs diversion at 50 percent duration river stage diverted into the Bayou Dupont area. Annual diversion corresponds to annual river stage hydrograph, controlled structure. Sediment enrichment assumes use of 20-inch dredge at capacity for three months. Three month yield = 1,468, 000 yd^3 at an average depth of 5 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 215-ppm additional sediment in the diversion at 38,000 cfs.
- **150,000 cfs diversion at Fort Jackson with sediment enrichment**. This feature provides for a 150,000 cfs diversion at 50 percent duration river stage into the Yellow Cotton / Hospital Bay area. Annual diversion corresponds to annual river stage

hydrograph, uncontrolled diversion. Sediment enrichment assumes use of 30-inch dredge at capacity for 3 months. Three month yield = 6,293, 000 yd^3 at an average depth of 7.5 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 233-ppm additional sediment in the diversion at 150,000 cfs.

- **Barrier Island restoration at Barataria Shoreline**. Mining of offshore sediment sources to reestablish barrier islands. Based on designs developed in the LCA Barrier Island Restoration study. Option assumes a 1,500-foot island width footprint.

Subprovince 2 - Alternative M3 (Mimic historic hydrology) – plate 16

Subprovince 2 - Alternative M3 (Mimic Historic Hydrology)
1. 1,000 cfs diversion at Lac des Allemands
2. 1,000 cfs diversion at Donaldsonville
3. 1,000 cfs diversion at Pikes Peak
4. 1,000 cfs diversion at Edgard
5. 75,000 cfs diversion at Myrtle Grove with sediment enrichment
6. 60,000 cfs at Fort Jackson with sediment enrichment
7. Barrier Island restoration at Barataria Shoreline

- **1,000 cfs diversion at Lac des Allemands**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands through Bayou Becnel. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Donaldsonville**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into upper Bayou Verret. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Pikes Peak**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Bayou Chevreuil. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Edgard**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands through Bayou Fortier. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **75,000 cfs diversion at Myrtle Grove with sediment enrichment.** This feature provides for a 75,000 cfs diversion at 50 percent duration river stage diverted for three months at five-year intervals. Diversion corresponds to available river stage hydrograph. Bonnet Carre type controlled structure. Sediment enrichment assumes use of 30-inch dredge at capacity for three-months. Three month yield = 6,293, 000 yd^3 at an average depth of 5 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 466-ppm additional sediment in the diversion at 75,000 cfs.
- **60,000 cfs diversion at Fort Jackson with sediment enrichment**. This feature provides for a 60,000 cfs diversion at 50 percent duration river stage into the Yellow Cotton / Hospital Bay area. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.
- **Barrier Island restoration at Barataria Shoreline**. Mining of offshore sediment sources to reestablish barrier islands. Based on designs developed in the LCA Barrier Island Restoration study. Option assumes a 3,000-foot island footprint.

Subprovince 2 -Increase (cut loss by 3,436 ac/yr.)

Subprovince 2 - Alternative E1 (Minimize salinity change) – plate 17

Subprovince 2 - Alternative E1 (Minimize salinity change)
1. 5,000 cfs diversion at Lac des Allemands with sediment enrichment
2. Sediment delivery via pipeline at Myrtle Grove
3. 5,000 cfs diversion at Myrtle Grove
4. Marsh creation at Marsh creation feasibility study sites
5. Sediment delivery via pipeline at Empire
6. Sediment delivery via pipeline at Bastian Bay/Buras
7. Sediment delivery via pipeline at Main Pass (Head of Passes)
8. 60,000 cfs diversion at Fort Jackson with sediment enrichment
9. Relocation of Deep Draft Navigation Channel
10. Barrier Island restoration at Barataria Shoreline

- **5,000 cfs diversion at Lac des Allemands with sediment enrichment**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands. Annual diversion corresponds to annual river stage hydrograph, controlled structure. Sediment enrichment assumes use of 12-inch dredge for three months. Discharge of effluent up stream of the diversion intake would allow the capture of silts and very fine sands only. This would result in capture of approximately 30 percent of the total dredge effluent (6,989 yd^3 / day).
- **Sediment delivery via pipeline at Myrtle Grove**. This feature provides for sediment delivery via sediment mined from the Mississippi River. Required dredging volume corresponding to a net yield of approximately 130 wetland acres per year.
- **5,000 cfs diversion at Myrtle Grove**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into the Bayou Dupont area. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **Marsh creation at Wetland Creation and Restoration Feasibility Study sites**. Sediment mined from Mississippi River placed in the sites along Bayou Lafourche, required dredging volume corresponding to a net yield of approximately 220 wetland acres per year.
- **Sediment delivery via pipeline at Empire**. This feature provides for sediment delivery via sediment mined from Mississippi River placed in Bay Adams. Required dredging volume corresponding to a net yield of approximately 115 wetland acres per year.
- **Sediment delivery via pipeline at Bastian Bay / Buras**. This feature provides for sediment delivery via sediment mined from Mississippi River placed in Bastian Bay. Required dredging volume corresponding to a net yield of approximately 48 wetland acres per year.
- **Sediment delivery via pipeline at Main Pass (Head of Passes).** This feature provides for sediment delivery via programmatic sediment mining from the Mississippi River utilizing a Sediment Trap above the Head of Passes. Estimated dredging volume nine

million cubic yards per year corresponding to a net yield of approximately 1,017 wetland acres per year.

- **60,000 cfs diversion at Fort Jackson with sediment enrichment.** This feature provides for a 60,000 cfs diversion at 50 percent duration river stage into the Yellow Cotton / Hospital Bay area. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion. Sediment enrichment assumes use of 20-inch dredge at capacity for three months. Three month yield = 1,468, 000 yd^3 at an average depth 7.5 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 136-ppm additional sediment in the diversion at 60,000 cfs.
- **Relocation of Deep Draft Navigation Channel**. This feature provides for relocation of main navigation channel away from Southwest Pass. Would require the construction of sail through locks and new 45-foot draft channel. Maintenance of Southwest pass would be continued at 35-foot draft. Reconfiguration of navigation system would result in increases in stage durations in the upper portion of the hydrograph causing more frequent overflow of the Mississippi River Delta and greater availability of river flow for diversion at upriver locations. Increased stages in Southwest pass are due to the decrease in cross-sectional area (45-foot draft to 35-foot draft).
- **Barrier Island restoration at Barataria Shoreline**. Mining of offshore sediment sources to reestablish barrier islands. Based on designs developed in the LCA Barrier Island Restoration study. Option assumes a 3,000-foot island footprint.

Subprovince 2 - Alternative E2 (Continuous Re-introduction) – plate 18

Subprovince 2 - Alternative E2 (Continuous Re-introduction)
1. 5,000 cfs diversion at Lac des Allemands with sediment enrichment
2. 5,000 cfs diversion at Pikes Peak with sediment enrichment
3. 5,000 cfs diversion at Edgard with sediment enrichment
4. 5,000 cfs diversion at Donaldsonville with sediment enrichment
5. 150,000 cfs diversion at Myrtle Grove with sediment enrichment
6. 90,000 cfs diversion at Empire
7. 60,000 cfs diversion at Fort Jackson with sediment enrichment
8. Barrier Island restoration at Barataria Shoreline

- **5,000 cfs diversion at Lac des Allemands with sediment enrichment**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands. Annual diversion corresponds to annual river stage hydrograph, controlled structure. Sediment enrichment assumes use of 12-inch dredge for three months. Discharge of effluent up stream of the diversion intake would allow the capture of silts and very fine sands only. This would result in capture of approximately 30 percent of the total dredge effluent (6,989 yd^3 / day).
- **5,000 cfs diversion at Pikes Peak with sediment enrichment.** This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into Bayou Chevreuil. Annual diversion corresponds to annual river stage hydrograph, controlled structure. Sediment enrichment assumes use of 12-inch dredge for three months. Discharge of effluent up stream of the diversion intake would allow the capture of silts and very fine

sands only. This would result in capture of approximately 30 percent of the total dredge effluent (6,989 yd^3 / day).

- **5,000 cfs diversion at Edgard with sediment enrichment**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands through Bayou Fortier, annual diversion corresponds to annual river stage hydrograph, controlled structure. Sediment enrichment assumes use of 12-inch dredge for three months. Discharge of effluent up stream of the diversion intake would allow the capture of silts and very fine sands only. This would result in capture of approximately 30 percent of the total dredge effluent (6,989 yd^3 / day).
- **5,000 cfs diversion at Donaldsonville with sediment enrichment**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into upper Bayou Verret. Annual diversion corresponds to annual river stage hydrograph, controlled structure. Sediment enrichment assumes use of 12-inch dredge for three months. Discharge of effluent up stream of the diversion intake would allow the capture of silts and very fine sands only. This would result in capture of approximately 30 percent of the total dredge effluent (6,989 yd^3 / day).
- **150,000 cfs diversion at Myrtle Grove with sediment enrichment**. This feature provides for a 150,000 cfs diversion at 50 percent duration river stage diverted into the Bayou Dupont area. Annual diversion corresponds to annual river stage hydrograph, controlled structure. Sediment enrichment assumes use of 30-inch dredge at capacity for three months. Three month yield = 6,293, 000 yd^3 at an average depth of 5 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 233-ppm additional sediment in the diversion at 150,000 cfs.
- **90,000 cfs diversion at Empire**. This feature provides for a 90,000 cfs diversion at 50 percent duration river stage diverted into Bay Adams. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.
- **60,000 cfs diversion at Fort Jackson with sediment enrichment**. This feature provides for a 60,000 cfs diversion at 50 percent duration river stage into the Yellow Cotton / Hospital Bay area. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion. Sediment enrichment assumes use of 20-inch dredge at capacity for three months. Three month yield = 1,468, 000 yd^3 at an average depth of 7.5 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 136-ppm additional sediment in the diversion at 60,000 cfs.
- **Barrier Island restoration at Barataria Shoreline**. Mining of offshore sediment sources to reestablish barrier islands. Based on designs developed in the LCA Barrier Island Restoration study. Option assumes a 3,000-foot island footprint.

Subprovince 2 - Alternative E3 (Mimic historic hydrology) – plate 19

Subprovince 2 - Alternative E3 (Mimic Historic Hydrology)
1. 5,000 cfs diversion at Lac des Allemands with sediment enrichment
2. 120,000 cfs diversion near Bayou Lafourche (Mississippi River Third Delta)
3. Marsh creation at Marsh creation feasibility study sites
4. 90,000 cfs diversion at Fort Jackson with sediment enrichment
5. Relocation of Deep Draft Navigation Channel
6. Barrier Island restoration at Barataria Shoreline

- **5,000 cfs diversion at Lac des Allemands with sediment enrichment**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands. Annual diversion corresponds to annual river stage hydrograph, controlled structure. Sediment enrichment assumes use of 12-inch dredge for three months. Discharge of effluent up stream of the diversion intake would allow the capture of silts and very fine sands only. This would result in capture of approximately 30 percent of the total dredge effluent (6,989 yd^3 / day).
- **120,000 cfs diversion at Bayou Lafourche (Mississippi River Third Delta).** This feature provides for a 120,000 cfs diversion at Bayou Lafourche. Approximately 240,000 cfs at maximum river stage diverted into a newly constructed conveyance channel (parallel to Bayou Lafourche), diversion corresponds to annual river stage hydrograph, diverted flow would be divided equally between the Barataria and Terrebonne hydrologic basins, controlled structure. Sediment enrichment assumes use of 30-inch dredge at capacity for three months. Three month yield = 6,293, 000 yd^3 at an average depth of 5 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 175-ppm additional sediment in the diversion at 200,000 cfs.
- **Marsh creation at Wetland Creation and Restoration Feasibility Study sites**. Sediment mined from Mississippi River placed in the sites along Bayou Lafourche, required dredging volume corresponding to a net yield of approximately 220 wetland acres per year.
- **90,000 cfs diversion at Fort Jackson with sediment enrichment.** This feature provides for a 90,000 cfs diversion at 50 percent duration river stage into the Yellow Cotton / Hospital Bay area. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion. Sediment enrichment assumes use of 24-inch dredge at capacity for three months. Three month yield = 2,727, 000 yd^3 at an average depth of 7.5 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 168-ppm additional sediment in the diversion at 90,000 cfs.
- **Relocation of Deep Draft Navigation Channel**. This feature provides for the relocation of main navigation channel away from Southwest Pass. Would require the construction of sail through locks and new 45-foot draft channel. Maintenance of Southwest pass would be continued at 35-foot draft. Reconfiguration of navigation system would result in increases in stage durations in the upper portion of the hydrograph causing more frequent overflow of the Mississippi River Delta and greater availability of river flow for diversion at upriver locations. Increased stages in Southwest pass are due to the decrease in cross-sectional area (45-foot draft to 35-foot draft).

- **Barrier Island restoration at Barataria Shoreline**. Mining of offshore sediment sources to reestablish barrier islands. Based on designs developed in the LCA Barrier Island Restoration study. Option assumes a 3,000-foot island footprint.

SUBPROVINCE 3 - TERREBONNE, ATCHAFALAYA AND TECHE / VERMILLION

This section would address alternatives for Subprovince 3 with the following scales: (1) reduce and (2) maintain. There is a total of ten alternatives for this subprovince: three "reduce" (R); one "maintain" (M); and No Action (N).

Subprovince 3	R1	R2	R3	M1						N1
Backfill pipeline canals			x	x						
Bayou Lafourche 1,000 cfs pump	x	x		x						x
Convey Atchafalaya River water to Terrebonne marshes	x		x	x						x
Freshwater introduction south of Lake Decade	x	x		x						
Freshwater introduction via Blue Hammock Bayou	x	x		x						x
Increase sediment transport down Wax Lake Outlet	x	x		x						x
Maintain land bridge between Bayous Dularge and Grand Caillou	x		x	x						x
Maintain land bridge between Caillou Lake and Gulf of Mexico.			x	x						x
Maintain northern shore of East Cote Blanche Bay at Pt. Marone			x	x						x
Maintain Timbalier land bridge			x	x						
Multipurpose operation of the Houma Navigation Canal (HNC) Lock.	x	x	x	x						x
Penchant Basin Plan	x	x	x	x						x
Rebuild historic reefs – Rebuild historic barrier between Point Au Fer and Eugene Island	x	x	x	x						
Rebuild historic reefs – Construct segmented reef/breakwater/jetty along the historic Point Au Fer barrier reef from Eugene Island extending towards Marsh Island to the west	x	x	x	x						
Rebuild Point Chevreuil Reef			x	x						x
Rehabilitate northern shorelines of Terrebonne/Timbalier Bays			x	x						
Relocate the Atchafalaya navigation channel	x	x		x						x
Restore Terrebonne barrier islands.			x	x						x
Stabilize banks of Southwest Pass			x	x						
Stabilize gulf shoreline of Point Au Fer Island			x	x						x
Study the modification of the Old River Control Structure (ORCS) Operational Scheme to Benefit Coastal Wetlands	x	x		x						x
Third Delta (120,000 cfs diversion)		x		x						

Note: Gross rates of restored/ protected wetlands: R = Reduce, 1,421 ac/yr; M = Maintain, 2,842 ac/yr; Scales: 1 = Maximize Atchafalaya (NIC 3rd Delta); 2 = Land-building by delta development; 3 = Mississippi and Atchafalaya flows. Column N1 represents the Supplemental Framework.

Subprovince 3 – Reduce Alternatives (cut loss by 1,421 ac/yr.)

Subprovince 3 - Alternative R1 (Maximize Atchafalaya Flow) – plate 20

Subprovince 3 - Alternative R1 (Maximize Atchafalaya Flow (does not include Third Delta)
1. Bayou Lafourche 1,000 cfs pump
2. Convey Atchafalaya River water to Terrebonne marshes
3. Freshwater introduction via Blue Hammock Bayou
4. Freshwater introduction south of Lake Decade
5. Penchant Basin Plan
6. Relocate the Atchafalaya navigation channel
7. Increase sediment transport down Wax Lake Outlet
8. Rebuild historic reefs – Rebuild historic barrier between Point Au Fer and Eugene
9. Rebuild historic reefs – Construct segmented reef/breakwater/jetty along the historic Point Au Fer barrier reef from Eugene Island extending towards Marsh Island to the west
10. Study the modification of the Old River Control Structure (ORCS) Operational Scheme to Benefit Coastal Wetlands
11. Multi-purpose operation of the Houma Navigation Canal Lock (HNC)
12. Maintain land bridge between Bayous Dularge and Grand Caillou

- **Bayou Lafourche 1,000 cfs pump.** A flow of 1000 CFS would be pumped into Bayou Lafourche. The targeted wetland benefit area is the area between Bayous Lafourche and Terrebonne, south of the GIWW. The flow would be continuous and would freshen the wetlands and would reduce loss rates.
- **Convey Atchafalaya River water to Terrebonne marshes.** Increase Atchafalaya River flows to Terrebonne Basin by a diversion in the Avoca Island Levee, repairing eroding banks of the GIWW, and enlarging constrictions in the GIWW below Gibson and in Houma. Ideally, half of Bayou Shaffer flow, or more, would be diverted (via an open unstructured cut through the levee) into Avoca Lake to maximize land building. The percent flow diverted would be reduced if high water level impacts in the Penchant marshes would be too great. A constriction structure in Bayou Shaffer would be installed downstream of the levee cut to force flow into Avoca Lake. Several new channels connecting the eastern portions of Avoca Lake with Bayou Chene would be constructed to facilitate the distribution of sediments (land-building) across a wider portion of the lake bottom. Introduced flows leaving Avoca Lake would be readily carried southward down Bayou Penchant, increasing its sediment load, compared to the existing conditions where water has to back-up to Bayou Penchant through the Avoca Island Cutoff Channel. In lieu of a diversion from Bayou Shaffer into Avoca Lake, an alternative might be to partial or fully breach the Avoca Island Extension Levee where Bayou Shaffer runs adjacent to the Avoca Island Cutoff Canal. This cut would also involve an open armored channel.

In conjunction with the Bayou Shaffer diversion, sections of eroded dredged material banks along the GIWW would be repaired to contain flows for more efficient delivery to areas of need further east and to halt boat wake-induced erosion of shoreline marshes.

In conjunction with the above features, and to better carry water eastward to brackish areas of need, the GIWW constrictions would be enlarged. In Bayou Chene, the channel is roughly 12,000 sq. feet. But between Bayou Black and Bay Wallace, the channel is reduced to 5,500 sq. feet. The most severe constriction is in Houma where cross-section is reduced to as little as 2,200 sq. feet at the Bayou Terrebonne junction. An initial concept is to construct and maintain an 8,000 sq. foot channel through Houma. This concept is very closely linked with project number 5a above and would be considered only if that project shows that the presently available freshwater can be fully utilized through features to introduce it into needy marshes south of the GIWW. This project would involve dredging to enlarge channel cross-section and relocations of businesses and utilities, together with bridge modifications as needed. The Houma GIWW tunnel may limit the degree to which the channel can be enlarged at the tunnel location.

- **Freshwater introduction via Blue Hammock Bayou.** Increase Atchafalaya Flow to SW Terrebonne via Blue Hammock Bayou. The project would increase the distribution of Atchafalaya flows in Fourleague Bay to Lake Merchant wetlands by increasing the cross-section of Blue Hammock Bayou. Marsh would be created with material dredged. Grand Pass and Buckskin Bayou, the outlets of Lake Merchant, would be reduced in cross section to increase the retention of Atchafalaya nutrients, sediment, and freshwater.
- **Freshwater introduction south of Lake Decade.** Enhance Atchafalaya flows to Terrebonne by constructing three small conveyance channels along the south shore of Lake Decade to the Small Bayou LaPointe area. Construct three conveyance channels along the south shore of Lake Decade to deliver Atchafalaya flows to wetlands between the lake, Bayou Dularge, and Lake Merchant. Channel flows would be controlled by structures that could be actively operated. Intermediate marsh losses would be reduced by lowering salinities and increasing nutrient inputs.
- **Penchant Basin Plan.** Reduce excessive water levels in the upper Penchant Subbasin by implementing the Penchant Basin Plan. The Penchant Basin Plan would increase the efficiency of Bayou Penchant to convey flows from the area wetlands as Atchafalaya River stages fall after spring floods. Increased outlet capacities would utilize the flows to increase the circulation and retention to wetlands in the more tidal zone below the large fresh floating marsh zone. Wetlands losses would be reduced in both zones (Louisiana State University (LSU) Controlled Ecological Life Support System (CELSS) model results).
- **Relocate the Atchafalaya navigation channel.** This feature consists of relocating the Atchafalaya navigation channel. The Navigation Channel route through the delta has been identified as the greatest impediment to the delta's growth. By rerouting the Channel and using a passive hydraulic structure at the point of departure in the Lower Atchafalaya River, river sediment would be used more efficiently in the delta lobes.
- **Increase sediment transport down Wax Lake Outlet.** Increase sediment transport down Wax Lake Outlet by extending the outlet northward through Cypress Island to connect to the Atchafalaya Main Channel. Currently, the Wax Lake Outlet (WLO) flows pass over the relatively shallow Six Mile Lake before entering the outlet. This feature

would connect the deep outlet directly to the deep Atchafalaya Main Channel thereby increasing more bed load sediments to be transported to the WLO delta. Increased delta growth was projected by the LSU CELSS Western Bays Model.

- **Rebuild Historic Reefs - Rebuild historic barrier between Point Au Fer and Eugene Island.** Enhance Atchafalaya River influence in eastern Atchafalaya Bay, Point Au Fer Island, and Four League Bay by rebuilding the historic barrier between Point Au Fer and Eugene Island. This 22,700-foot barrier would separate Atchafalaya Bay from the gulf and would follow the historic Point Au Fer reef alignment. The barrier could be a reef, a barrier island, an intertidal spit, or a segmented breakwater. The barrier would increase delta development by reducing the effects of gulf waves and the erosive effects of strong frontal passages. It would benefit Point au Fer Island wetlands and Fourleague Bay wetlands by increasing Atchafalaya River influence while reducing gulf influence.
- **Rebuild Historic Reefs - Construct segmented reef/breakwater/jetty along the historic Point Au Fer barrier reef from Eugene Island extending towards Marsh ISLAND to the west**. Enhance Atchafalaya Delta growth and Atchafalaya River influence in Sub Province 3 by constructing a segmented reef/breakwater/jetty along the historic Point Au Fer barrier reef from Eugene Island extending towards Marsh Island to the west. The 107,700-foot barrier would join the Bayou Sale natural levee feature. This feature would reduce delta wetland erosion caused by gulf wave action and would increase containment of Atchafalaya sediments in Atchafalaya Bay.
- **Study the modification of the Old River Control Structure (ORCS) operational scheme to benefit coastal wetlands.** This proposal would alter the ORCS operational framework with a goal of increasing the sediment load to be transported by the Atchafalaya River. An approximate 20 percent increase in delta growth was proposed as the feature objective but would be refined upon detailed evaluation of the feature. Detailed studies of this proposal would include determination of impacts (beneficial and adverse) to the interior of the Atchafalaya Basin, the degree to which flow and sediment distributions would be required, and the increased costs of maintaining the flood control, navigation, and environmental features along the Lower Mississippi, Red and Atchafalaya Rivers.
- **Multi-purpose operation of the Houma Navigation Canal (HNC) Lock.** Multi-purpose operation of the Houma Navigation Canal Lock and related Morganza to the Gulf Hurricane Protection Project features. Improve the distribution of Atchafalaya flows through the HNC to the west in Falgout Canal, to the marshes east and west of the HNC, to the marshes south of the Lake Boudreaux Basin, and to the Grand Bayou marshes east of Bayou Point Au Chien. Structures would be operated during periods of low freshwater flows to reduce intrusion of high salinity water into low salinity wetlands.
- **Maintain land bridge between Bayous Dularge and Grand Caillou.** Construct a land bridge between Bayous DuLarge and Grand Caillou south of Falgout Canal and northeast of Caillou Lake. A grid of numerous trenasses has artificially increased the hydrologic connection between interior marshes with Caillou Lake and adjoining waterbodies. This problem would be addressed by depositing hydraulically dredged material to close the trenasses and areas of broken marsh to create a continuous 300-foot-wide and 21,000-foot-long berm of "high marsh" extending from Bayou Grand Caillou to Bayou DuLarge (leaving Bayou Sauveur open). This berm would separate the higher healthy brackish/saline marshes bordering the northeast end of Caillou Lake from the

deteriorating inland intermediate/brackish marshes. It would also allow the freshwater flowing down the HNC and Bayou Grand Caillou to have a greater influence on interior marshes through existing water exchange points along Bayou Grand Caillou, north of the proposed land bridge.

Subprovince 3 - Alternative R2 (Land building by delta development) – plate 21

Subprovince 3 - Alternative R2 (Land building by delta development)
1. Bayou Lafourche 1,000 cfs pump
2. Third Delta (120,000 cfs diversion)
3. Relocate the Atchafalaya navigation channel
4. Increase sediment transport down Wax Lake Outlet
5. Rebuild historic reefs – Rebuild historic barrier between Point Au Fer and Eugene Island
6. Rebuild historic reefs – Construct segmented reef/breakwater/jetty along the historic Point Au Fer barrier reef from Eugene Island extending towards Marsh Island to the west
7. Study the modification of the Old River Control Structure (ORCS) operational scheme to benefit Coastal Wetlands
8. Freshwater introduction via Blue Hammock Bayou
9. Freshwater introduction south of Lake Decade
10. Penchant Basin Plan
11. Multi-purpose operation of the Houma Navigation Canal Lock (HNC)

- **Bayou Lafourche 1,000 cfs pump.** A flow of 1,000 CFS would be pumped into Bayou Lafourche. The scale wetland benefit area is the area between Bayous Lafourche and Terrebonne, south of the GIWW. The flow would be continuous and would freshen the wetlands and would reduce loss rates.
- **Third Delta (120,000 cfs diversion).** Build land in upper Timbalier Subbasin with a Mississippi River diversion (Third Delta). The Third Delta conveyance channel would parallel the east side of the Bayou Lafourche natural levee and split into 2 distributary channels. One would distribute flow and sediment to the Little Lake area of the Pointe au Chien area of the Timbalier Subbasin. The conveyance channel would be sized to have land building capability similar to the Wax Lake Outlet. (120,000 cfs with sediment enrichment)
- **Relocate the Atchafalaya navigation channel.** This feature consists of relocating the Atchafalaya navigation channel. The Navigation Channel route through the delta has been identified as the greatest impediment to the delta's growth. By rerouting the Channel and using a passive hydraulic structure at the point of departure in the Lower Atchafalaya River, river sediment would be used more efficiently in the delta lobes.
- **Increase sediment transport down Wax Lake Outlet.** Increase sediment transport down Wax Lake Outlet by extending the outlet northward through Cypress Island to connect to the Atchafalaya Main Channel. Currently, the Wax Lake Outlet (WLO) flows pass over the relatively shallow Six Mile Lake before entering the outlet. This feature would connect the deep outlet directly to the deep Atchafalaya Main Channel thereby

increasing more bed load sediments to be transported to the WLO delta. Increased delta growth was projected by the LSU CELSS Western Bays Model.

- **Rebuild Historic Reefs - Rebuild historic barrier between Point Au Fer and Eugene Island.** Enhance Atchafalaya River influence in eastern Atchafalaya Bay, Point Au Fer ISLAND, and Four League Bay by rebuilding the historic barrier between Point Au Fer and Eugene ISLAND. This 22,700-foot barrier would separate Atchafalaya Bay from the gulf and would follow the historic Point Au Fer reef alignment. The barrier could be a reef, a barrier island, an intertidal spit, or a segmented breakwater. The barrier would increase delta development by reducing the effects of gulf waves and the erosive effects of strong frontal passages. It would benefit Point au Fer Island wetlands and Fourleague Bay wetlands by increasing Atchafalaya River influence while reducing gulf influence.
- **Rebuild Historic Reefs - Construct segmented reef/breakwater/jetty along the historic Point Au Fer barrier reef from Eugene Island extending towards Marsh ISLAND to the west**. Enhance Atchafalaya Delta growth and Atchafalaya River influence in Sub Province 3 by constructing a segmented reef/breakwater/jetty along the historic Point Au Fer barrier reef from Eugene Island extending towards Marsh Island to the west. The 107,700-foot barrier would join the Bayou Sale natural levee feature. This feature would reduce delta wetland erosion caused by wave action of increased containment of Atchafalaya sediments in Atchafalaya Bayou.
- **Study the modification of the Old River Control Structure (ORCS) operational scheme to benefit coastal wetlands.** This proposal would alter the ORCS operational framework with a goal of increasing the sediment load to be transported by the Atchafalaya River. An approximate 20 percent increase in delta growth was proposed as the feature objective but would be refined upon detailed evaluation of the feature. Detailed studies of this proposal would include determination of impacts (beneficial and adverse) to the interior of the Atchafalaya Basin, the degree to which flow and sediment distributions would be required, and the increased costs of maintaining the flood control, navigation, and environmental features along the Lower Mississippi, Red and Atchafalaya Rivers.
- **Freshwater introduction via Blue Hammock Bayou.** This feature provides for Increasing Atchafalaya Flow to SW Terrebonne via Blue Hammock Bayou. The project would increase the distribution of Atchafalaya flows in Fourleague Bay to Lake Merchant wetlands by increasing the cross-section of Blue Hammock Bayou. Marsh would be created with material dredged. Grand Pass and Buckskin Bayou, the outlets of Lake Merchant, would be reduced in cross section to increase the retention of Atchafalaya nutrients, sediment, and freshwater.
- **Freshwater introduction south of Lake Decade.** Enhance Atchafalaya flows to Terrebonne by constructing three small conveyance channels along the south shore of Lake Decade to the Small Bayou LaPointe area. Construct three conveyance channels along the south shore of Lake Decade to deliver Atchafalaya flows to wetlands between the lake, Bayou Dularge, and Lake Merchant. Channel flows would be controlled by structures that could be actively operated. Intermediate marsh losses would be reduced by lowering salinities and increasing nutrient inputs.
- **Penchant Basin Plan.** Reduce excessive water levels in the upper Penchant Subbasin by implementing the Penchant Basin Plan. The Penchant Basin Plan would increase the efficiency of Bayou Penchant to convey flows from the area wetlands as Atchafalaya

River stages fall after spring floods. Increased outlet capacities would utilize the flows to increase the circulation and retention to wetlands in the more tidal zone below the large fresh floating marsh zone. Wetlands losses would be reduced in both zones (LSU CELSS model results).

- **Multi-purpose operation of the Houma Navigation Canal (HNC) Lock.** This feature provides for the multi-purpose operation of the Houma Navigation Canal Lock and related Morganza to the Gulf Hurricane Protection Project features. Improve the distribution of Atchafalaya flows through the HNC to the west in Falgout Canal, to the marshes east and west of the HNC, to the marshes south of the Lake Boudreaux Basin, and to the Grand Bayou marshes east of Bayou Point Au Chien. Structures would be operated during periods of low freshwater flows to reduce intrusion of high salinity water into low salinity wetlands.

Subprovince 3 - Alternative R3 (Mississippi and Atchafalaya Flows) – plate 22

Subprovince 3 - Alternative R3 (Mississippi and Atchafalaya Flows)
1. Stabilize banks of Southwest Pass
2. Maintain northern shore of East Cote Blanche Bay at P Marone
3. Rebuild Point Chevreuil Reef
4. Rehabilitate Terrebonne Barrier Islands
5. Rehabilitate northern shorelines of Terrebonne/Timbalier Bays
6. Backfill pipeline canals
7. Multi-purpose operation of the Houma Navigation Canal Lock
8. Maintain land bridge between Bayous Dularge and Grand Caillou
9. Maintain land bridge between Caillou Lake and the gulf
10. Stabilize gulf shoreline of Pt. Au Fer Island
11. Maintain Timbalier land bridge
12. Rebuild historic reefs – Rebuild historic barrier between Point Au Fer and Eugene Island
13. Rebuild historic reefs – Construct segmented reef/breakwater/jetty along the historic Point Au Fer barrier reef from Eugene Island extending towards Marsh Island to the west
14. Convey Atchafalaya River water to Terrebonne marshes
15. Penchant Basin Plan

Maximum rehabilitation/maintenance of geomorphic features

- **Stabilize banks of Southwest Pass.** Maintain Southwest Pass integrity by protecting bay and gulf Shorelines. Southwest Pass banks are eroding and may result in greater exchange between Vermilion Bay and the gulf. The pass banks would be stabilized with armor to maintain the existing pass dimensions. This would involve the construction of 9.33 miles of dike at a width of 200 feet.
- **Maintain northern shore of East Cote Blanche Bay at P. Marone.** Protect North shore of East Cote Blanche Bay from Point Marone to Jackson Bayou. Approximately 23,600 feet of bay shoreline would be stabilized to protect the interior wetland water circulation patterns in the Cote Blanche Wetlands CWPPRA project. The project was

designed to increase the retention time of the Atchafalaya flows moving from the GIWW to East Cote Blanche Bay. Shoreline erosion is thought to have increased with dredging of shell reefs between the bay and gulf.

- **Rebuild Point Chevreuil Reef.** This feature provides for rebuilding historic Point Chevreuil Reef toward Marsh Island. Rehabilitate the Bayou Sale natural levee between Point Chervil and the gulf. The natural levee would be rebuilt in the form of a shallow sub aqueous platform, small islands, and/or reefs. The historic shell reefs were removed by shell dredging. The feature would be about 12 miles long and would deflect some of Atchafalaya flow and sediments from entering East Cote Blanche Bay resulting in slightly higher salinities in the bay. Overall, this feature would restore some semblance of historic hydrologic conditions in the Teche/Vermilion Basin.
- **Rehabilitate Terrebonne barrier islands.** This feature provides for the restoration of the Timbalier and Derrieres barrier island chains (Alternative a). This would simulate the 1890 condition with fewer breaches than now. The islands would be widened to 600m and the dune crest elevation would be 2.7 m (NGVD).
- **Rehabilitate northern shorelines of Terrebonne/Timbalier Bays.** This feature provides for the rehabilitation of the northern shorelines of Terrebonne/Timbalier Bays with a segmented breakwater from the Seabreeze area to the Little Lake area. Rebuild and maintain the historic shoreline integrity around Terrebonne and Timbalier Bays by constructing 338,000 feet of segmented barrier along the west side of Terrebonne Bay, across the historic shoreline alignment along the northern sides of both bays, and along the east of Timbalier Bay. This feature was simulated by a wave model in DNR-funded Barrier Shoreline Feasibility Study conducted by T. Baker Smith (1999). The model results showed substantial benefits in reducing wetlands loss along the shoreline.
- **Backfill pipeline canals.** This feature provides for the backfill of pipeline canals S. of Catfish Lake. The Twin Pipeline canals in this area are crossed by numerous oilfield canals greatly altering natural water circulation patterns. The 63,300 feet of pipeline canals would be filled at strategic locations to restore primary water circulation through Grand Bayou Blue. The retention time of Atchafalaya and Bayou Lafourche (pumped) flows would be increased to benefit effected wetlands.
- **Multi-purpose operation of the Houma Navigation Canal Lock.** This feature provides for the multi-purpose operation of the Houma Navigation Canal Lock and related Morganza to the Gulf Hurricane Protection Project features. Improve the distribution of Atchafalaya flows through the HNC to the west in Falgout Canal, to the marshes east and west of the HNC, to the marshes south of the Lake Boudreaux Basin, and to the Grand Bayou marshes east of Bayou Point Au Chien. Structures would be operated during periods of low freshwater flows to reduce intrusion of high salinity water into low salinity wetlands.
- **Maintain land bridge between Bayous Dularge and Grand Caillou.** This feature provides for construction of a land bridge between Bayous DuLarge and Grand Caillou south of Falgout Canal and northeast of Caillou Lake. A grid of numerous trenasses has artificially increased the hydrologic connection between interior marshes with Caillou Lake and adjoining waterbodies. This problem would be addressed by depositing hydraulically dredged material to close the trenasses and areas of broken marsh to create a continuous 300-foot-wide and 21,000-foot-long berm of "high marsh" extending from Bayou Grand Caillou to Bayou DuLarge (leaving Bayou Sauveur open). This berm

would separate the higher healthy brackish/saline marshes bordering the northeast end of Caillou Lake from the deteriorating inland intermediate/brackish marshes. It would also allow the freshwater flowing down the HNC and Bayou Grand Caillou to have a greater influence on interior marshes through existing water exchange points along Bayou Grand Caillou, north of the proposed land bridge.

- **Maintain land bridge between Caillou Lake and the gulf.** Maintain the land bridge between the gulf and Caillou Lake by shore protection in Grand Bayou DuLarge to minimize salinity intrusion. This project would involve 43,000 feet of rock armoring or marsh creation to plug/fill broken marsh areas on the west bank of lower Grand Bayou DuLarge, where a new channel is threatening to breach the bayou bank and allow the establishment of a new connection with Caillou Lake. Some gulf shore armoring would likely be needed to protect these features from erosion on the gulf shoreline. A more systemic and comprehensive solution would involve a much greater amount of gulf shoreline armoring, especially toward the west where shoreline retreat and loss of shoreline oyster reefs has allowed for increased water exchange between the gulf and the interior waterbodies (between Bay Junop and Caillou Lake). Some of the newly opened channels would be closed to restore historic cross-sections of exchange points. By reducing marine influences in these interior areas, these features might also allow increased riverine influences from Four League Bay to benefit area marshes.
- **Stabilize gulf shoreline of Point Au Fer Island.** This feature provides for stabilizing the gulf shoreline of Point Au Fer Island. Stabilize 81,500 feet of the gulf shoreline of Point Au Fer I to prevent direct connections between the gulf and interior water bodies. The gulf shoreline erosion would be arrested along the island thereby reducing the direct losses from the erosion. Indirectly, island marsh loss would be reduced by preventing the interior water circulation avenues from being connected directly to the gulf rather than Atchafalaya Bay and Fourleague Bay. The fresh nutrient and sediment rich bay waters provide for wetland needs much better than the high salinity gulf waters.
- **Maintain Timbalier land bridge.** This feature provides for maintaining the Timbalier land bridge in the upper salt marsh zone. A grid of numerous trenasses has artificially increased the hydrologic connection between interior marshes with Caillou Lake and adjoining waterbodies. This problem would be addressed by depositing hydraulically dredged material to close the trenasses and areas of broken marsh to create a continuous 2,000-foot-wide and 111,000-foot-long berm of "high marsh" extending from Bayou Terrebonne to Bayou Lafourche (leaving several Bayous open). This berm would allow the freshwater flowing down from the GIWW through Grand Bayou to have a greater influence on interior marshes through existing water exchange points along Grand Bayou north of the proposed land bridge.
- **Rebuild historic reef - Rebuild historic barrier between Point Au Fer and Eugene Island.** Enhance Atchafalaya River influence in eastern Atchafalaya Bay, Pt Au Fer Island, and Four League Bay by rebuilding the historic barrier between Point Au Fer and Eugene Island. This 22,700-foot barrier would separate Atchafalaya Bay from the gulf and would follow the historic Point Au Fer reef alignment. The barrier could be a reef, a barrier island, an intertidal spit, or a segmented breakwater. The barrier would increase delta development by reducing the effects of gulf waves and the erosive effects of strong frontal passages. It would benefit Point au Fer Island wetlands and Fourleague Bay wetlands by increasing Atchafalaya River influence while reducing gulf influence.

- **Rebuild historic reef - Construct segmented reef/breakwater/jetty along the historic Point Au Fer barrier reef from Eugene Island extending towards Marsh ISLAND to the west.** Enhance Atchafalaya Delta growth and Atchafalaya River influence in Sub Province 3 by constructing a segmented reef/breakwater/jetty along the historic Point Au Fer barrier reef from Eugene Island extending towards Marsh Island to the west. The 107,700-foot barrier would join the Bayou Sale natural levee feature. This feature would reduce delta wetland erosion caused by wave action of increased containment of Atchafalaya sediments in Atchafalaya Bayou.
- **Convey Atchafalaya River water to Terrebonne marshes.** This feature provides for enhancing existing Atchafalaya River influence to central (Lake Boudreaux) and eastern (Grand Bayou) Terrebonne marshes via GIWW. During peak Atchafalaya River stages, over 10,000 cfs of water flows into Houma via the GIWW. Most (70 percent) of this flows southward through the HNC to the bays. The remainder flows eastward through the GIWW, past Larose, into the Barataria Basin. This project would introduce flow into the Grand Bayou basin by enlarging the connecting channel (Bayou L'Eau Bleu) so to capture as much of the surplus flow (max. 2000-4000 cfs) that is otherwise leaves the Terrebonne Basin. Initial alternatives to be evaluated through hydrologic models include enlargement to a uniform 1,200 and 2,000 sq. feet through the entire length of the Bayou L'Eau Bleu/Grand Bayou Canal channels. Another scale area to be evaluated is the enlargement of the St. Louis Canal to 600 sq. feet from the GIWW southward to Bayou Pointe au Chien (presently its roughly 100 -150 sq. feet at narrowest sections). In all cases, gated control structures would be installed to restrict channel cross-section during the salty season to prevent increased saltwater intrusion. Some alternatives may include auxiliary freshwater distribution structures to improve the distribution of introduced freshwater. For the Lake Boudreaux Basin scale area, introduction would be evaluated via Bayou Pelton (1,500 sq. foot cross section) and at Company Canal (1,000 sq. foot cross-section). When fully implemented, this project might involve construction of one alternative at Bayou L'Eau Bleu, St. Louis Canal, Bayou Pelton, and Company Canal.
- **Penchant Basin Plan.** Reduce excessive water levels in the upper Penchant Subbasin by implementing the Penchant Basin Plan. The Penchant Basin Plan would increase the efficiency of Bayou Penchant to convey flows from the area wetlands as Atchafalaya River stages fall after spring floods. Increased outlet capacities would utilize the flows to increase the circulation and retention to wetlands in the more tidal zone below the large fresh floating marsh zone. Wetlands losses would be reduced in both zones (LSU CELSS model results).

Subprovince 3 - Maintain (cut loss by 2,842 ac/yr.)

Subprovince 3 - Alternative M1 (All features) – plate 23

Subprovince 3 – Alternative M1 (Use all features)
1. Third Delta (120,000 cfs diversion)
2. Bayou Lafourche 1,000 cfs pump
3. Relocate the Atchafalaya navigation channel
4. Increase sediment transport down Wax Lake Outlet
5. Rebuild historic reefs – Rebuild historic barrier between Point Au Fer and Eugene Island
6. Rebuild historic reefs – Construct segmented reef/breakwater/jetty along the historic Point Au Fer barrier reef from Eugene Island extending towards Marsh Island to the west
7. Study the modification of the Old River Control Structure (ORCS) Operational Scheme to Benefit Coastal Wetlands
8. Convey Atchafalaya River water to Terrebonne marshes
9. Freshwater introduction via Blue Hammock Bayou
10. Freshwater introduction south of Lake Decade
11. Penchant Basin Plan
12. Stabilize banks of Southwest Pass
13. Maintain northern shore of East Cote Blanche Bay at Pt. Marone
14. Rebuild Point Chevreuil Reef
15. Rehabilitate Terrebonne Barrier Islands
16. Rehabilitate northern shorelines of Terrebonne/Timbalier Bays
17. Backfill pipeline canals
18. Multi-purpose operation of the Houma Navigation Canal Lock
19. Maintain land bridge between Bayous Dularge and Grand Caillou
20. Maintain land bridge between Caillou Lake and the gulf
21. Stabilize gulf shoreline of Point Au Fer Island
22. Maintain Timbalier land bridge

- **Third Delta (120,000 cfs diversion).** Build land in upper Timbalier Subbasin with a Mississippi River diversion (Third Delta). The Third Delta conveyance channel would parallel the east side of the Bayou Lafourche natural levee and split into two distributary channels. One would distribute flow and sediment to the Little Lake area of the Pointe au Chien area of the Timbalier Subbasin. The conveyance channel would be sized to have land building capability similar to the Wax Lake Outlet. (120,000 cfs with sediment enrichment)

- **Bayou Lafourche 1,000 cfs pump.** A flow of 1000 CFS would be pumped into Bayou Lafourche. The scale wetland benefit area is the area between Bayous Lafourche and Terrebonne, south of the GIWW. The flow would be continuous and would freshen the wetlands and would reduce loss rates.
- **Relocate the Atchafalaya navigation channel.** This feature consists of relocating the Atchafalaya navigation channel. The Navigation Channel route through the delta has been identified as the greatest impediment to the delta's growth. By rerouting the Channel and using a passive hydraulic structure at the point of departure in the Lower Atchafalaya River, river sediment would be used more efficiently in the delta lobes.
- **Increase sediment transport down Wax Lake Outlet.** Increase sediment transport down Wax Lake Outlet by extending the outlet northward through Cypress Island to connect to the Atchafalaya Main Channel. Currently, the Wax Lake Outlet (WLO) flows pass over the relatively shallow Six Mile Lake before entering the outlet. This feature would connect the deep outlet directly to the deep Atchafalaya Main Channel thereby increasing more bed load sediments to be transported to the WLO delta. Increased delta growth was projected by the LSU CELSS Western Bays Model.
- **Rebuild Historic Reefs - Rebuild historic barrier between Point Au Fer and Eugene Island.** Enhance Atchafalaya River influence in eastern Atchafalaya Bay, Pt Au Fer Island, and Four League Bay by rebuilding the historic barrier between Point Au Fer and Eugene Island This 22,700-foot barrier would separate Atchafalaya Bay from the gulf and would follow the historic Point Au Fer reef alignment. The barrier could be a reef, a barrier island, an intertidal spit, or a segmented breakwater. The barrier would increase delta development by reducing the effects of gulf waves and the erosive effects of strong frontal passages. It would benefit Point au Fer I wetlands and Fourleague Bay wetlands by increasing Atchafalaya River influence while reducing gulf influence.
- **Rebuild Historic Reefs - Construct segmented reef/breakwater/jetty along the historic Point Au Fer barrier reef from Eugene Island extending towards Marsh Island to the west**. Enhance Atchafalaya Delta growth and Atchafalaya River influence in Sub Province 3 by constructing a segmented reef/breakwater/jetty along the historic Point Au Fer barrier reef from Eugene Island extending towards Marsh I to the west. The 107,700-foot barrier would join the Bayou Sale natural levee feature. This feature would reduce delta wetland erosion caused by wave action of increased containment of Atchafalaya sediments in Atchafalaya Bayou.
- **Study the modification of the Old River Control Structure (ORCS) operational scheme to benefit coastal wetlands.** This proposal would alter the ORCS operational framework with a goal of increasing the sediment load to be transported by the Atchafalaya River. An approximate 20 percent increase in delta growth was proposed as the feature objective but would be refined upon detailed evaluation of the feature. Detailed studies of this proposal would include determination of impacts (beneficial and adverse) to the interior of the Atchafalaya Basin, the degree to which flow and sediment distributions would be required, and the increased costs of maintaining the flood control, navigation, and environmental features along the Lower Mississippi, Red and Atchafalaya Rivers.
- **Convey Atchafalaya River water to Terrebonne marshes.** This feature provides for increasing Atchafalaya River flows to Terrebonne Basin by a diversion in the Avoca Island Levee, repairing eroding banks of the GIWW, and enlarging constrictions in the

GIWW below Gibson and in Houma. Ideally, half of Bayou Shaffer flow, or more, would be diverted (via an open unstructured cut through the levee) into Avoca Lake to maximize land building. The percent flow diverted would be reduced if high water level impacts in the Penchant marshes would be too great. A constriction structure in Bayou Shaffer would be installed downstream of the levee cut to force flow into Avoca Lake. Several new channels connecting the eastern portions of Avoca Lake with Bayou Chene would be constructed to facilitate the distribution of sediments (land-building) across a wider portion of the lake bottom. Introduced flows leaving Avoca Lake would be readily carried southward down Bayou Penchant, increasing its sediment load, compared to the existing conditions where water has to back-up to Bayou Penchant through the Avoca Island Cutoff Channel. In lieu of a diversion from Bayou Shaffer into Avoca Lake, an alternative might be to partially or fully breach the Avoca Island Extension Levee where Bayou Shaffer runs adjacent to the Avoca Island Cutoff Canal. This cut would also involve an open armored channel.

In conjunction with the Bayou Shaffer diversion, sections of eroded dredged material banks along the GIWW would be repaired to contain flows for more efficient delivery to areas of need further east and to halt boat wake-induced erosion of shoreline marshes.

In conjunction with the above features, and to better carry water eastward to brackish areas of need, the GIWW constrictions would be enlarged. In Bayou Chene, the channel is roughly 12,000 sq. feet. But between Bayou Black and Bay Wallace, the channel is reduced to 5,500 sq. feet. The most severe constriction is in Houma where cross-section is reduced to as little as 2,200 sq. feet at the Bayou Terrebonne junction. An initial concept is to construct and maintain an 8,000 sq. foot channel through Houma. This concept is very closely linked with project number 5a above and would be considered only if that project shows that the presently available freshwater can be fully utilized through features to introduce it into needy marshes south of the GIWW. This project would involve dredging to enlarge channel cross-section and relocations of businesses and utilities, together with bridge modifications as needed. The Houma GIWW tunnel may limit the degree to which the channel can be enlarged at the tunnel location.

- **Freshwater introduction via Blue Hammock Bayou.** This feature provides for Increasing Atchafalaya Flow to SW Terrebonne via Blue Hammock Bayou. The project would increase the distribution of Atchafalaya flows in Fourleague Bay to Lake Merchant wetlands by increasing the cross-section of Blue Hammock Bayou. Marsh would be created with material dredged. Grand Pass and Buckskin Bayou, the outlets of Lake Merchant, would be reduced in cross section to increase the retention of Atchafalaya nutrients, sediment, and freshwater.
- **Freshwater introduction south of Lake Decade.** Enhance Atchafalaya flows to Terrebonne by constructing three small conveyance channels along the south shore of Lake Decade to the Small Bayou LaPointe area. Construct 3 conveyance channels along the south shore of Lake Decade to deliver Atchafalaya flows to wetlands between the lake, Bayou Dularge, and Lake Merchant. Channel flows would be controlled by structures that could be actively operated. Intermediate marsh losses would be reduced by lowering salinities and increasing nutrient inputs.

- **Penchant Basin Plan.** Reduce excessive water levels in the upper Penchant Subbasin by implementing the Penchant Basin Plan. The Penchant Basin Plan would increase the efficiency of Bayou Penchant to convey flows from the area wetlands as Atchafalaya River stages fall after spring floods. Increased outlet capacities would utilize the flows to increase the circulation and retention to wetlands in the more tidal zone below the large fresh floating marsh zone. Wetlands losses would be reduced in both zones (LSU CELSS model results).
- **Stabilize banks of Southwest Pass.** Maintain Southwest Pass integrity by protecting bay and gulf Shorelines. Southwest Pass banks are eroding and may result in greater exchange between Vermilion Bay and the gulf. The pass banks would be stabilized with armor to maintain the existing pass dimensions. This would involve the construction of 9.33 miles of dike at a width of 200 feet.
- **Maintain northern shore of East Cote Blanche Bay at Point Marone.** Protect North shore of East Cote Blanche Bay from Point Marone to Jackson Bayou. Approximately 23,600 feet of bay shoreline would be stabilized to protect the interior wetland water circulation patterns in the Cote Blanche Wetlands CWPPRA project. The project was designed to increase the retention time of the Atchafalaya flows moving from the GIWW to East Cote Blanche Bay. Shoreline erosion is thought to have increased with dredging of shell reefs between the bay and gulf.
- **Rebuild Point Chevreuil Reef.** This feature provides for rebuilding historic Point Chevreuil Reef toward Marsh Island. Rehabilitate the Bayou Sale natural levee between Point Chervil and the gulf. The natural levee would be rebuilt in the form of a shallow sub aqueous platform, small islands, and/or reefs. The historic shell reefs were removed by shell dredging. The feature would be about 12 miles long and would deflect some of Atchafalaya flow and sediments from entering East Cote Blanche Bay resulting in slightly higher salinities in the bay. Overall, this feature would restore some semblance of historic hydrologic conditions in the Teche/Vermilion Basin.
- **Rehabilitate Terrebonne barrier islands.** This feature provides for the restoration of the Timbalier and Derrieres barrier island chains (Alternative a). This would simulate the 1890 condition with fewer breaches than now. The islands would be widened to 600m and the dune crest elevation would be 2.7 m (NGVD).
- **Rehabilitate northern shorelines of Terrebonne/Timbalier Bays.** This feature provides for the rehabilitation of the northern shorelines of Terrebonne/Timbalier Bays with a segmented breakwater from the Seabreeze area to the Little Lake area. Rebuild and maintain the historic shoreline integrity around Terrebonne and Timbalier Bays by constructing 338,000 feet of segmented barrier along the west side of Terrebonne Bay, across the historic shoreline alignment along the northern sides of both bays, and along the east of Timbalier Bay. This feature was simulated by a wave model in DNR-funded Barrier Shoreline Feasibility Study conducted by T. Baker Smith (1999). The model results showed substantial benefits in reducing wetlands loss along the shoreline.
- **Backfill pipeline canals.** This feature provides for the backfill of pipeline canals S. of Catfish Lake. The Twin Pipeline canals in this area are crossed by numerous oilfield canals greatly altering natural water circulation patterns. The 63,300 feet of pipeline canals would be filled at strategic locations to restore primary water circulation through Grand Bayou Blue. The retention time of Atchafalaya and Bayou Lafourche (pumped) flows would be increased to benefit effected wetlands.

- **Multi-purpose operation of the Houma Navigation Canal Lock.** This feature provides for the multi-purpose operation of the Houma Navigation Canal Lock and related Morganza to the Gulf Hurricane Protection Project features. Improve the distribution of Atchafalaya flows through the HNC to the west in Falgout Canal, to the marshes east and west of the HNC, to the marshes south of the Lake Boudreaux Basin, and to the Grand Bayou marshes east of Bayou Point Au Chien. Structures would be operated during periods of low freshwater flows to reduce intrusion of high salinity water into low salinity wetlands.
- **Maintain land bridge between Bayous Dularge and Grand Caillou.** This feature provides for construction of a land bridge between Bayous DuLarge and Grand Caillou south of Falgout Canal and northeast of Caillou Lake. A grid of numerous trenasses has artificially increased the hydrologic connection between interior marshes with Caillou Lake and adjoining waterbodies. This problem would be addressed by depositing hydraulically dredged material to close the trenasses and areas of broken marsh to create a continuous 300-foot-wide and 21,000-foot-long berm of "high marsh" extending from Bayou Grand Caillou to Bayou DuLarge (leaving Bayou Sauveur open). This berm would separate the higher healthy brackish/saline marshes bordering the northeast end of Caillou Lake from the deteriorating inland intermediate/brackish marshes. It would also allow the freshwater flowing down the HNC and Bayou Grand Caillou to have a greater influence on interior marshes through existing water exchange points along Bayou Grand Caillou, north of the proposed land bridge.
- **Maintain land bridge between Caillou Lake and the gulf.** Maintain the land bridge between the gulf and Caillou Lake by shore protection in Grand Bayou DuLarge to minimize salinity intrusion. This project would involve 43,000 feet of rock armoring or marsh creation to plug/fill broken marsh areas on the west bank of lower Grand Bayou DuLarge, where a new channel is threatening to breach the bayou bank and allow the establishment of a new connection with Caillou Lake. Some gulf shore armoring would likely be needed to protect these features from erosion on the gulf shoreline. A more systemic and comprehensive solution would involve a much greater amount of gulf shoreline armoring, especially toward the west where shoreline retreat and loss of shoreline oyster reefs has allowed for increased water exchange between the gulf and the interior waterbodies (between Bay Junop and Caillou Lake). Some of the newly opened channels would be closed to restore historic cross-sections of exchange points. By reducing marine influences in these interior areas, these features might also allow increased riverine influences from Four League Bay to benefit area marshes.
- **Stabilize gulf shoreline.** This feature provides for stabilizing the gulf shoreline of Point Au Fer Island. Stabilize 81,500 feet of the gulf shoreline of Point Au Fer I to prevent direct connections between the gulf and interior water bodies. The gulf shoreline erosion would be arrested along the island thereby reducing the direct losses from the erosion. Indirectly, island marsh loss would be reduced by preventing the interior water circulation avenues from being connected directly to the gulf rather than Atchafalaya Bay and Fourleague Bay. The fresh nutrient and sediment rich bay waters provide for wetland needs much better than the high salinity gulf waters.
- **Maintain Timbalier land bridge.** This feature provides for maintaining the Timbalier land bridge in the upper salt marsh zone. A grid of numerous trenasses has artificially increased the hydrologic connection between interior marshes with Caillou Lake and

adjoining waterbodies. This problem would be addressed by depositing hydraulically dredged material to close the trenasses and areas of broken marsh to create a continuous 2,000-foot-wide and 111,000-foot-long berm of "high marsh" extending from Bayou Terrebonne to Bayou Lafourche (leaving several Bayous open). This berm would allow the freshwater flowing down from the GIWW through Grand Bayou to have a greater influence on interior marshes through existing water exchange points along Grand Bayou north of the proposed land bridge.

SUBPROVINCE 4 – CHENIER PLAIN

This section would address alternatives for Subprovince 4 with the following scales: (1) maintain and (2) increase. There is a total of ten alternatives for this subprovince: three "maintain" (M); three "increase" (E); and No Action (N).

Subprovince 4				M1	M2	M3	E1	E2	E3	N1
Black Bayou Bypass culverts.										x
Calcasieu Pass Lock				x			x			
Calcasieu Ship Channel Beneficial Use				x	x	x	x	x	x	x
Chenier Plain Freshwater Management and Allocation Reassessment.										x
Dedicated Dredging for Marsh Restoration					x	x		x	x	
East Sabine Hydrologic Restoration					x			x		x
Freshwater introduction at Highway 82				x	x	x	x	x	x	x
Freshwater introduction at Little Pecan Bayou				x	x	x	x	x	x	x
Freshwater introduction at Pecan Island				x	x	x	x	x	x	x
Freshwater introduction at Rollover Bayou				x	x	x	x	x	x	x
Freshwater introduction at South Grand Chenier				x	x	x	x	x	x	x
Freshwater introduction via Calcasieu Lock and Black Bayou culverts						x			x	
Gulf Shoreline Stabilization					x		x	x	x	x
Modify existing Cameron-Creole Watershed Control Structures					x			x		x
New Lock at the GIWW					x			x		
Sabine Pass Lock				x			x			
Salinity control at Alkali Ditch					x			x		x
Salinity control at Black Bayou					x			x		x
Salinity control at Black Lake Bayou					x			x		x
Salinity control at Highway 82 Causeway					x	x		x	x	x
Salinity control at Long Point Bayou.					x			x		x
Salinity control at Oyster Bayou					x			x		x

Note: Gross rates of restored/ protected wetlands: M = Maintain, 461 ac/yr ; E = Enhance, 692 ac/yr;
Scales: 1 = Large-scale salinity control; 2 = Perimeter salinity control; 3 = Freshwater introduction salinity control. Column N1 represents the Supplemental Framework.

Subprovince 4 – Maintain [Marsh Gain; 461 ac/yr, Marsh Gain Equals/Exceeds - 461 ac/yr Loss Rate]

Subprovince 4 - Alternative M1 (Large Scale Salinity Control) – plate 24

Subprovince 4 - Alternative M1 (Large Scale Salinity Control)
1. Sabine Pass Lock
2. Calcasieu Pass Lock
3. Freshwater introduction at Pecan Island
4. Freshwater introduction at Rollover Bayou
5. Freshwater introduction at Highway 82
6. Freshwater introduction at Little Pecan Bayou
7. Freshwater introduction at South Grand Chenier
8. Calcasieu Ship Channel Beneficial Use

- **Sabine Pass Lock.** Gate/Lock on Sabine Pass south of Lighthouse Bayou near gulf ; 42 feet deep X 500 feet or > wide with a medium boat bay (crew and shrimp boats); (Boat bay - 100 feet wide X 12 feet deep)**.**
- **Calcasieu Pass Lock.** Lock in Pass, Lock & natural pass open, Lock & natural pass constricted. Gate or lock in the Calcasieu Ship Channel with a small to medium boat bay (100 feet wide X 12 feet deep) or bypass through historic natural river pass. Located in the vicinity of Monkey Island.
- **Freshwater Introduction at Pecan Island**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin at Pecan Island.
- **Freshwater Introduction at Rollover Bayou**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin at Rollover Bayou.
- **Freshwater Introduction at Highway 82**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin at the Highway 82 area between Rollover Bayou and Superior Canal into eastern Rockefeller Refuge.
- **Freshwater Introduction at Little Pecan Bayou.** This feature provides for Movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin west of Rockefeller Refuge at the Thibodeaux Bridge.
- **Freshwater Introduction at South Grand Chenier**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin from the Mermentau River across Hwy 82 to the Chenier Subbasin to the Hog Bayou Watershed.
- **Calcasieu Ship Channel Beneficial Use**. This feature provides for beneficial use of dredged material from the Calcasieu Ship Channel.

Subprovince 4 - Alternative M2 (Perimeter Salinity Control) – plate 25

Subprovince 4 - Alternative M2 (Perimeter Salinity Control)
1. Salinity control at Oyster Bayou
2. Salinity control at Long Point Bayou
3. Salinity control at Black Lake Bayou
4. Salinity control at Alkali Ditch
5. New Lock at the GIWW
6. Modify existing Cameron-Creole Watershed Control Structures
7. East Sabine Lake Hydrologic Restoration
8. Salinity control at Black Bayou
9. Salinity control at Highway 82 Causeway
10. Freshwater introduction at Pecan Island
11. Freshwater introduction at Rollover Bayou
12. Freshwater introduction at Highway 82
13. Freshwater introduction at Little Pecan Bayou
14. Freshwater introduction at South Grand Chenier
15. Calcasieu Ship Channel Beneficial Use
16. Dedicated Dredging for Marsh Restoration
17. Gulf Shoreline Stabilization

- **Calcasieu Subbasin Perimeter Framework**
  - **Salinity control at Oyster Bayou**. Salinity control in Oyster Bayou with a gated structure or rock weir. Location in Oyster Bayou about 1 mile west of Calcasieu Ship Channel 100-150 feet wide X 10 feet deep; with an approximately 15-20 foot wide X 4 foot deep boat bay.
  - **Salinity control at Long Point Bayou**. Salinity control in Long Point Bayou with a gated structure or rock weir located in Long Point Bayou north of Sabine NWR near Hwy 27 west of the Calcasieu Ship Channel (Existing dimensions equal 40 feet wide X 5 feet deep; structure approximate dimensions are 10 to 15 feet wide X 4 feet deep boat bay).
  - **Salinity control at Black Lake Bayou.** - Salinity control in Black Lake Bayou with gated structure or rock weir with boat bay. Location in Black Lake Bayou north of Hackberry near Calcasieu Ship Channel (Existing bayou dimensions are approximately 150 feet wide X10 feet deep; gated structure or rock weir approximate dimensions equal 25 to 50 feet wide X 6 to 8 feet deep boat bay).
  - **Salinity control at Alkali Ditch**. - Salinity control at the Alkali Ditch, northwest of Hackberry, LA at the GIWW, with gated structure or rock weir with barge bay (Existing dimensions are approximately 150 to 200 feet wide X 8 to10 feet deep; structure or weir with approximate dimensions 70 feet wide X 8 feet deep).
  - **New Lock at the GIWW**. - New Lock at the GIWW east of Alkali Ditch dimensions - 75 -110 feet wide X 15 feet deep.
  - **Modify existing Cameron-Creole Watershed Control Structures**. The Cameron-Creole watershed project constructed in 1989 consists of 5 large concrete water control structures and a 16 mile-long levee along the shoreline of

Calcasieu Lake. Three of the five structures (Grand Bayou, Bois Connine Bayou, and Lambert Bayou) are adjustable structure with slide gates and the remaining two (Mangrove Bayou and No Name Bayou) are fixed crest weir structures. The fixed crest weir sill heights may be set too high. This higher setting could be contributing to the impoundment problem within Cameron-Creole marshes adjacent to those structures. If the weir sills for these two structures could be modified to lower weir crests reduced impoundment, greater water flow, and increased fisheries access independent of salinity control at Calcasieu Pass.

- **Sabine Subbasin Perimeter Framework**
    - **East Sabine Lake Hydrologic Restoration**. East Sabine Lake Hydrologic Restoration Project between Sabine Lake and Sabine NWR Pool 3; salinity control structures at Willow Bayou, Three Bayou, Greens Bayou and Right Prong of Black Bayou, terracing, Sabine Lake shoreline protection, & smaller structures.
    - **Salinity control at Black Bayou**. Salinity control structure with boat bay at mouth of Black Bayou (either gated structure or a rock weir), located at the intersection of Black Bayou and the northeastern shoreline of Sabine Lake (Existing bayou dimensions are 150 to 200 feet wide X 10 feet deep).
    - **Salinity control at Highway 82 Causeway**. This feature provides rock weir at Hwy 82 Causeway located in the southern portion of Sabine Lake north of Sabine Pass and the Sabine-Neches Waterway Existing dimensions equal approximately 3,400 feet wide by approximately 4 feet deep except at the approximate 10 feet deep center channel.

- **Freshwater Introduction at Pecan Island**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin.
- **Freshwater Introduction at Rollover Bayou**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin.
- **Freshwater Introduction at Highway 82**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin at the Highway 82 area between Rollover Bayou and Superior Canal to the eastern portion of Rockefeller Refuge.
- **Freshwater Introduction at Little Pecan Bayou.** This feature provides for Movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin west of Rockefeller Refuge at the Thibodeaux Bridge.
- **Freshwater Introduction at South Grand Chenier**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lakes Subbasin from the Mermentau River across Hwy 82 to the Chenier Subbasin Hog Bayou Watershed.
- **Calcasieu Ship Channel Beneficial Use**. This feature provides for beneficial use of dredged material from the Calcasieu Ship Channel.
- **Dedicated Dredging for Marsh Restoration**. Use Dredged Material Beneficially to restore 5,000 acres or more on Sabine NWR and adjacent properties. Locations for marsh restoration would be north and NW of Browns Lake on Sabine NWR. Average water depths equal 1.5 to 2 feet deep.

- **Gulf Shoreline Stabilization**. This feature provides for gulf shoreline stabilization from Mermentau Ship Channel to near Rollover Bayou. Gulf Shoreline Stabilization using rock foreshore dikes, offshore reefs, or segmented breakwaters. Located from Mermentau Ship Channel to near Rollover Bayou east of Rockefeller Refuge. Foreshore dikes 25 to 50 feet gulfward of shore in shallow water 1 to 3 feet deep with gaps every 1,000 feet. Subaqueous rock reef placed 150 to 100 feet gulfward from shore in 2 to 5 feet depth of water. Segmented breakwaters designed similar to Holly Beach Breakwaters placed closer to shore (100 feet or closer) and with narrower gaps (approximately 250 feet long with 50 feet gaps).

Subprovince 4 - Alternative M3 (Freshwater Introduction Salinity Control) – plate 26

Subprovince 4 - Alternative M3 (Freshwater Introduction Salinity Control)
1. Salinity control at Highway 82 Causeway
2. Freshwater introduction via Calcasieu Lock and the Black Bayou culverts
3. Freshwater introduction at Pecan Island
4. Freshwater introduction at Rollover Bayou
5. Freshwater introduction at Highway 82
6. Freshwater introduction at Little Pecan Bayou
7. Freshwater introduction at South Grand Chenier
8. Calcasieu Ship Channel Beneficial Use
9. Dedicated Dredging for Marsh Restoration

- **Salinity control at Highway 82 Causeway**. This feature provides for a Rock Weir at Hwy 82 Causeway. Hwy 82 Causeway located in the southern portion of Sabine Lake north of Sabine Pass & the Sabine-Neches Channel. Dimensions - 3,400 feet wide by about 4 feet deep except middle channel > 10 feet deep.
- **Freshwater introduction via Calcasieu Lock and the Black Bayou culverts.** This feature provides for the replacement of the Calcasieu Lock in the GIWW west of the Hwy 384 Bridge and use old lock for freshwater introduction to the upper Calcasieu estuary from the Mermentau Basin. This feature also provides for freshwater introduction via the Black Bayou Culverts feature at the intersection of Black Bayou and Hwy 384.
- **Freshwater Introduction at Pecan Island**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin.
- **Freshwater Introduction at Rollover Bayou**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin.
- **Freshwater Introduction at Highway 82**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin at the Highway 82 area between Rollover Bayou and Superior Canal to the eastern portion of Rockefeller Refuge.

- **Freshwater Introduction at Little Pecan Bayou.** This feature provides for Movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin west of Rockefeller Refuge at the Thibodeaux Bridge.
- **Freshwater Introduction at South Grand Chenier**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lakes Subbasin from the Mermentau River across Hwy 82 to the Chenier Subbasin Hog Bayou Watershed.
- **Calcasieu Ship Channel Beneficial Use**. This feature provides for beneficial use of dredged material from the Calcasieu Ship Channel.
- **Dedicated Dredging for Marsh Restoration**. Use Dredged Material Beneficially to restore 5,000 acres or more on Sabine NWR and adjacent properties. Locations for marsh restoration would be north and NW of Browns Lake on Sabine NWR. Average water depths equal 1.5 to 2 feet deep.

Subprovince 4 – Increase [Marsh Gain; 692 ac/yr, Reduce Loss 1.5 Times Loss Rate (- 461ac/yr)]

Subprovince 4 - Alternative E1 (Large Scale Salinity Control) – plate 27

Subprovince 4 – Alternative E1 (Large Scale Salinity Control)
1. Sabine Pass Lock
2. Calcasieu Pass Lock
3. Freshwater introduction at Pecan Island
4. Freshwater introduction at Rollover Bayou
5. Freshwater introduction at Highway 82
6. Freshwater introduction at Little Pecan Bayou
7. Freshwater introduction at South Grand Chenier
8. Gulf Shoreline Stabilization
9. Calcasieu Ship Channel Beneficial Use

- **Sabine Pass Lock.** Gate/Lock on Sabine Pass south of Lighthouse Bayou near gulf ; 42 feet deep X 500 feet or > wide with a medium boat bay (crew and shrimp boats); (Boat bay - 100 feet wide X 12 feet deep)**.**
- **Calcasieu Pass Lock.** Lock in Pass, Lock & natural pass open, Lock & natural pass constricted. Gate or lock in the Calcasieu Ship Channel with a small to medium boat bay (100 feet wide by 12 feet deep) or bypass through historic natural river pass. Located in the vicinity of Monkey Island.
- **Freshwater Introduction at Pecan Island**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin at Pecan Island.
- **Freshwater Introduction at Rollover Bayou**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin at Rollover Bayou.
- **Freshwater Introduction at Highway 82**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the

Chenier Subbasin at the Highway 82 area between Rollover Bayou and Superior Canal into eastern Rockefeller Refuge.

- **Freshwater Introduction at Little Pecan Bayou.** This feature provides for Movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin west of Rockefeller Refuge at the Thibodeaux Bridge.
- **Freshwater Introduction at South Grand Chenier**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin from the Mermentau River across Hwy 82 to the Chenier Subbasin to the Hog Bayou Watershed.
- **Gulf Shoreline Stabilization**. This feature provides for gulf shoreline stabilization from Mermentau Ship Channel to near Rollover Bayou. Gulf Shoreline Stabilization using rock foreshore dikes, offshore reefs, or segmented breakwaters. Located from Mermentau Ship Channel to near Rollover Bayou east of Rockefeller Refuge. Foreshore dikes 25 to 50 feet gulfward of shore in shallow water 1 to 3 feet deep with gaps every 1,000 feet. Subaqueous rock reef placed 150 to 100 feet gulfward from shore in 2 to 5 feet depth of water. Segmented breakwaters designed similar to Holly Beach Breakwaters placed closer to shore (100 feet or closer) and with narrower gaps (approximately 250 feet long with 50 feet gaps).
- **Calcasieu Ship Channel Beneficial Use**. This feature provides for beneficial use of dredged material from the Calcasieu Ship Channel.

Subprovince 4 - Alternative E2 (Perimeter Salinity Control) – plate 28

Subprovince 4 – Alternative E2 (Perimeter Salinity Control)
1. Salinity control at Oyster Bayou
2. Salinity control at Long Point Bayou
3. Salinity control at Black Lake Bayou
4. Salinity control at Alkali Ditch
5. New Lock at the GIWW
6. Modify existing Cameron-Creole Watershed Control Structures
7. East Sabine Lake Hydrologic Restoration
8. Salinity control at Black Bayou
9. Salinity control at Highway 82 Causeway
10. Freshwater introduction at Pecan Island
11. Freshwater introduction at Rollover Bayou
12. Freshwater introduction at Highway 82
13. Freshwater introduction at Little Pecan Bayou
14. Freshwater introduction at South Grand Chenier
15. Gulf Shoreline Stabilization
16. Calcasieu Ship Channel Beneficial Use
17. Dedicated Dredging for Marsh Restoration

- **Calcasieu Subbasin Perimeter Framework**
    - **Salinity control at Oyster Bayou**. Salinity control in Oyster Bayou with a gated structure or rock weir. Location in Oyster Bayou about 1 mile west of Calcasieu Ship Channel 100-150 feet wide X 10 feet deep; with an approximately 15-20 feet wide X 4 feet deep boat bay.

- **Salinity control at Long Point Bayou**. Salinity control in Long Point Bayou with a gated structure or rock weir located in Long Point Bayou north of Sabine NWR near Hwy 27 west of Calcasieu Ship Channel (Existing dimensions equal 40 feet wide X 5 feet deep; structure approximate dimensions are 10 to 15 feet wide X 4 feet deep boat bay).
- **Salinity control at Black Lake Bayou.** - Salinity control in Black Lake Bayou with gated structure or rock weir with boat bay. Location in Black Lake Bayou north of Hackberry near Calcasieu Ship Channel (Existing bayou dimensions are approximately 150 feet wide X10 feet deep; gated structure or rock weir approximate dimensions equal 25 to 50 feet wide X 6 to 8 feet deep boat bay).
- **Salinity control at Alkali Ditch**. - Salinity control at the Alkali Ditch, northwest of Hackberry, LA at the GIWW, with gated structure or rock weir with barge bay (Existing dimensions are approximately 150 to 200 feet wide X 8 to10 feet deep; structure or weir with approximate dimensions 70 feet wide X 8 feet deep.
- **New Lock at the GIWW**. - New Lock at the GIWW east of Alkali Ditch dimensions - 75 -110 feet wide X 15 feet deep.
- **Modify existing Cameron-Creole Watershed Control Structures**. The Cameron-Creole watershed project constructed in 1989 consists of 5 large concrete water control structures and a 16 mile-long levee along the shoreline of Calcasieu Lake. Three of the five structures (Grand Bayou, Bois Connine Bayou, and Lambert Bayou) are adjustable structure with slide gates and the remaining two (Mangrove Bayou and No Name Bayou) are fixed crest weir structures. The fixed crest weir sill heights may be set too high. This higher setting could be contributing to the impoundment problem within Cameron-Creole marshes adjacent to those structures. If the weir sills for these two structures could be modified to lower weir crests reduced impoundment, greater water flow and increased fisheries access independent of salinity control at Calcasieu Pass.

- **Sabine Subbasin Perimeter Framework**
  - **East Sabine Lake Hydrologic Restoration**. East Sabine Lake Hydrologic Restoration Project between Sabine Lake and Sabine NWR Pool 3; salinity control structures at Willow Bayou, Three Bayou, Greens Bayou and Right Prong of Black Bayou, terracing, Sabine Lake shoreline protection, & smaller structures.
  - **Salinity control at Black Bayou**. Salinity control structure with boat bay at mouth of Black Bayou (either gated structure or a rock weir), located at the intersection of Black Bayou and the northeastern shoreline of Sabine Lake (Existing bayou dimensions are 150 to 200 feet wide X 10 feet deep).
  - **Salinity control at Highway 82 Causeway**. This feature provides rock weir at Hwy 82 Causeway located in the southern portion of Sabine Lake north of Sabine Pass and the Sabine-Neches Waterway Existing dimensions equal approximately 3,400 feet wide by approximately 4 feet deep except at the approximate 10 feet deep center channel.
- **Freshwater Introduction at Pecan Island**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin.

- **Freshwater Introduction at Rollover Bayou**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin.
- **Freshwater Introduction at Highway 82**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin at the Highway 82 area between Rollover Bayou and Superior Canal to the eastern portion of Rockefeller Refuge.
- **Freshwater Introduction at Little Pecan Bayou.** This feature provides for Movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin west of Rockefeller Refuge at the Thibodeaux Bridge.
- **Freshwater Introduction at South Grand Chenier**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lakes Subbasin from the Mermentau River across Hwy 82 to the Chenier Subbasin Hog Bayou Watershed.
- **Gulf Shoreline Stabilization**. This feature provides for gulf shoreline stabilization from Mermentau Ship Channel to near Rollover Bayou. Gulf Shoreline Stabilization using rock foreshore dikes, offshore reefs, or segmented breakwaters. Located from Mermentau Ship Channel to near Rollover Bayou east of Rockefeller Refuge. Foreshore dikes 25 to 50 feet gulfward of shore in shallow water 1 to 3 feet deep with gaps every 1,000 feet. Subaqueous rock reef placed 150 to 100 feet gulfward from shore in 2 to 5 feet depth of water. Segmented breakwaters designed similar to Holly Beach Breakwaters placed closer to shore (100 feet or closer) and with narrower gaps (approximately 250 feet long with 50-foot gaps).
- **Calcasieu Ship Channel Beneficial Use**. This feature provides for beneficial use of dredged material from the Calcasieu Ship Channel.
- **Dedicated Dredging for Marsh Restoration**. Use Dredged Material Beneficially to restore 5,000 acres or more on Sabine NWR and adjacent properties. Locations for marsh restoration would be north and NW of Browns Lake on Sabine NWR. Average water depths equal 1.5 to 2 feet deep.

Subprovince 4 - Alternative E3 (Freshwater Introduction Salinity Control) – plate 29

Subprovince 4 - Alternative E3 (Freshwater Introduction Salinity Control)
1. Freshwater introduction via Calcasieu Lock and Black Bayou culverts
2. Salinity control at Highway 82 Causeway
3. Freshwater introduction at Pecan Island
4. Freshwater introduction at Rollover Bayou
5. Freshwater introduction at Highway 82
6. Freshwater introduction at Little Pecan Bayou
7. Freshwater introduction at South Grand Chenier
8. Calcasieu Ship Channel Beneficial Use
9. Dedicated Dredging for Marsh Restoration
10. Gulf Shoreline Stabilization

- **Salinity control at Highway 82 Causeway**. This feature provides for a Rock Weir at Hwy 82 Causeway. Hwy 82 Causeway located in the southern portion of Sabine Lake north of Sabine Pass & the Sabine-Neches Channel. Dimensions - 3,400 feet wide by about 4 feet deep except middle channel > 10 feet deep.
- **Freshwater introduction via Calcasieu Lock and the Black Bayou culverts.** This feature provides for the replacement of the Calcasieu Lock in the GIWW west of the Hwy 384 Bridge and use old lock for freshwater introduction to the upper Calcasieu estuary from the Mermentau Basin. This feature also provides for freshwater introduction via the Black Bayou Culverts feature at the intersection of Black Bayou and Hwy 384.
- **Freshwater Introduction at Pecan Island**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin.
- **Freshwater Introduction at Rollover Bayou**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin.
- **Freshwater Introduction at Highway 82**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin at the Highway 82 area between Rollover Bayou and Superior Canal to the eastern portion of Rockefeller Refuge.
- **Freshwater Introduction at Little Pecan Bayou.** This feature provides for Movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin west of Rockefeller Refuge at the Thibodeaux Bridge.
- **Freshwater Introduction at South Grand Chenier**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lakes Subbasin from the Mermentau River across Hwy 82 to the Chenier Subbasin Hog Bayou Watershed.
- **Calcasieu Ship Channel Beneficial Use**. This feature provides for beneficial use of dredged material from the Calcasieu Ship Channel.
- **Dedicated Dredging for Marsh Restoration**. Use Dredged Material Beneficially to restore 5,000 acres or more on Sabine NWR and adjacent properties. Locations for marsh restoration would be north and NW of Browns Lake on Sabine NWR. Average water depths equal 1.5 to 2 feet deep.
- **Gulf Shoreline Stabilization**. This feature provides for gulf shoreline stabilization from Mermentau Ship Channel to near Rollover Bayou. Gulf Shoreline Stabilization using rock foreshore dikes, offshore reefs, or segmented breakwaters. Located from Mermentau Ship Channel to near Rollover Bayou east of Rockefeller Refuge. Foreshore dikes 25 to 50 feet gulfward of shore in shallow water 1 to 3 feet deep with gaps every 1,000 feet. Subaqueous rock reef placed 150 to 100 feet gulfward from shore in 2 to 5 feet depth of water. Segmented breakwaters designed similar to Holly Beach Breakwaters placed closer to shore (100 feet or closer) and with narrower gaps (approximately 250 feet long with 50 foot gaps).

SUPPLEMENTAL FRAMEWORK

This section would address the supplemental framework for Subprovinces 1-4, including the State Framework for Subprovince 2.

Subprovince 1 - Supplemental Framework (modified M2)

For Subprovince 1, the overall restoration approach is centered on the continuous re-introduction of freshwater from the Mississippi River to the portions of the Deltaic Plain through multiple freshwater diversions. Under this approach, many of the restoration features would be operated with a continuous (i.e., year-round) water flow, with discharge volumes varying according to river stages and ceasing whenever river stages are too low. Restoration strategies for the subprovince include wetland creation and hydrologic restoration via freshwater diversions, sediment diversions, and dedicated dredging and hydrologic restoration via implementation of environmental restoration projects recommended in the Mississippi River Gulf Outlet (MRGO) Study.

The relatively low subsidence rates over much of this subprovince, coupled with the relatively sparse population in much of the land to the east of the Mississippi River (outside the Greater New Orleans area), offer some of the best freshwater diversion opportunities along the coast for wetland creation and large-scale sustainable restoration. Additionally, the influence of smaller rivers in the subprovince continues to provide beneficial nourishment to freshwater marshes and wetland forests, particularly in areas north of Lakes Maurepas and Pontchartrain. Supplemental Framework features in Subprovince 1 include:

Subprovince 1 - Supplemental Framework (modified M2) - plate 30

Subprovince 1 – Supplemental Framework (modified M2)
1. 5,000 cfs diversion at Convent / Blind River.
2. 1,000 cfs diversion at Hope Canal.
3. 10,000 cfs diversion at White's Ditch.
4. 110,000 cfs diversion at American / California Bay with sediment enrichment.
5. 12,000 cfs diversion at Bayou Lamoque.
6. Increase Amite River influence by gapping dredged material banks on diversion canals.
7. Sediment delivery via pipeline at Labranche.
8. Rehabilitate Violet Siphon and post authorization change for the diversion of water through Inner Harbor Navigation Canal for enhanced influence into Central Wetlands.
9. Marsh nourishment on the New Orleans East land bridge.
10. Reauthorization of the Caernarvon freshwater diversion (optimize for marsh creation).
11. Mississippi River Gulf Outlet Environmental Features and Salinity Control Study.
12. Authorized opportunistic use of the Bonnet Carre Spillway.
13. Mississippi River Delta Management Study.

- **5,000 cfs diversion at Convent / Blind River.** This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into the Blind River headwater. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Hope Canal**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage. Annual diversion corresponds to annual river stage hydrograph, controlled structure (current EPA project based on single box culvert).
- **10,000 cfs diversion at White's Ditch**. This feature provides for a 10,000 cfs diversion at 50 percent duration river stage into central Riv aux Chene area. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **110,000 cfs diversion at American / California Bay with sediment enrichment**. This feature provides for a 110,000 cfs diversion at 50 percent duration river stage. Annual diversion corresponds to available river stage, uncontrolled diversion. Sediment enrichment assumes use of 24-inch dredge at capacity for three months. Three month yield =2,727, 000 yd^3 at an average depth of 10 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 138-ppm additional sediment in the diversion at 110,000 cfs.
- **12,000 cfs diversion at Bayou Lamoque**. This feature provides for the refurbishment and operation of the existing Bayou Lamoque diversion structures 12,000 cfs - 12,000 cfs at maximum river stage, annual diversion corresponds to annual river stage hydrograph, controlled structures require mechanical rehabilitation and operational security modifications.
- **Increase Amite River influence by gapping dredged material banks on diversion canals.** This restoration feature involves the construction of gaps in the existing dredged material banks of the Amite River diversion canal. The purpose is to introduce sediments and nutrients into Maurepas Swamp to the west of Lake Maurepas. The Maurepas Swamp is classified as a wetland forest, and contains extensive cypress swamps. The area has experienced severe deterioration due to subsidence, a lack of freshwater circulation, and a lack of nourishment through the introduction of new sediments and nutrients. Because most of the cypress are starved for nutrients and land building sediments, they are unable to keep pace with subsidence. The proposed introduction of some freshwater and sediment during high water events would facilitate organic deposition in and productivity of the swamp and prevent further swamp deterioration.
- **Sediment delivery via pipeline at Labranche.** This feature provides for sediment delivery via sediment mined from the Mississippi River. The required dredging volume would correspond to a net yield of approximately 72 wetland acres per year.
- **Rehabilitate Violet Siphon and post authorization change for the diversion of water through Inner Harbor Navigation Canal for enhanced influence into Central Wetlands.** This restoration feature involves the rehabilitation of the existing Violet Siphon structure. The purposes are to improve the operation of the Violet Siphon and enhance freshwater flows into the Central Wetlands. The cypress swamps in this area have been lost due to saltwater intrusion, and the intermediate marshes are stressed by subsidence and a lack of freshwater, sediment, and nutrients. This success of this feature would be enhanced with the freshwater introductions via the Inter Harbor Navigation Channel Lock feature.

- **Marsh nourishment on the New Orleans East land bridge.** This restoration feature involves wetland creation through the dedicated dredging of sediments from offshore sources. The purpose of this feature is to create wetlands by placing dredged sediments in the shallow open waters within the land bridge separating Lakes Pontchartrain and Borgne the Labranche Wetlands. This area has experienced some wetland deterioration and loss due to erosion from wave energies in Lake Borgne. Reinforcing the land bridge between the two lakes would help maintain the salinity gradients in Lake Pontchartrain and ensure the long-term sustainability of the wetland ecosystems in the area.
- **Reauthorization of the Caernarvon freshwater diversion (optimize for marsh creation).** Since its construction in 1992, the Caernarvon structure has been operated as a salinity control feature, with freshwater introductions ranging between 1,000 cfs to 10,000 cfs. The primary purpose of the Caernarvon project has been to maintain salinity gradients in the central portion of Breton Sound. The proposed LCA restoration feature would seek a re-authorization of the Caernarvon project purpose to include wetland creation and restoration, thereby altering the project's operational framework and increasing the average freshwater introduction rate to 5,000 cfs on average. This change would help decrease the rate of wetland loss in the area.
- **Mississippi River Gulf Outlet Environmental Features and Salinity Control Study.** This restoration feature involves the implementation of the environmental restoration projects contained in the MRGO Study. In response to public concerns, environmental affects and national economic development considerations, an ongoing study is re-evaluating the viability of operation and maintenance of this project. This study would also recommend various environmental restoration projects that would reduce saltwater intrusion into Lake Pontchartrain, the Biloxi marshes, the Central Wetlands, and the Golden Triangle marshes, which has degraded large expanses of freshwater marshes and accelerated habitat switching in these areas.
- **Authorized opportunistic use of the Bonnet Carre Spillway.** This restoration feature involves freshwater introductions via the opportunistic use of the existing flood control structure at the Bonnet Carre Spillway. The spillway is currently operated to remove excess water from the Mississippi River during flooding events and pass the water through the Bonnet Carre Spillway into Lake Pontchartrain. This feature would allow for freshwater introductions to be delivered to Lake Pontchartrain and the Labranche wetlands during times of high river water levels. Thus, the river diversions would help reduce salinities in the southwest corner of Lake Pontchartrain and nourish the intermediate and brackish marshes with sediment and nutrients.
- **Mississippi River Delta Management Study.** The study is to greatly increase the deposition of Mississippi River sediments on the shallow continental shelf, while insuring navigation interests. Sediment, nutrients and fresh water would be re-directed to restore the quality and sustainability of the Mississippi River Delta Plain, its coastal wetland complex, and the Gulf of Mexico.

Subprovince 2 – Supplemental Framework (modified R1)

For Subprovince 2, the overall restoration approach is to promote a sustainable wetland ecosystem without radically altering the future salinity gradients and wetland habitat types. Freshwater re-introductions affect salinity gradients and, therefore, can result in significant ecological changes. Many of the societal and economic benefits provided by the ecosystem are currently based on the distribution of marsh types and salinity conditions that have prevailed over several decades. While the long-term goal of freshwater introductions is to ensure a healthy, productive, and sustainable coast, such features can change fisheries and wetland habitats such that local harvesters and communities can no longer realize these benefits. The question then becomes whether it is possible to minimize such potential changes, while still providing for a sustainable coastal ecosystem. Consistent with this conceptual framework, the restoration approach for this subprovince relies less on freshwater introduction and more on marsh creation using external sediment sources (off-shore and riverine sources). Although the primary features for building marsh platforms are mechanical, limited freshwater re-introductions are included to nourish existing and restored wetlands and to help ensure their long-term sustainability. The restoration approach for the subprovince also includes barrier island restoration via re-nourishment.

While there exist significant opportunities for wetland creation and large-scale sustainable restoration in this subprovince, the subprovince also presents several challenges that limit the ability to restore riverine influences to the area. The western portions of the subprovince are far removed from the existing Mississippi River and the potential to deliver substantial amounts of sediment to that area is relatively low. In addition, the subprovince is comparatively well developed, and this development influences the ability to rehabilitate wetlands near the coastal communities.

Subprovince 2 - Supplemental Framework (modified R1) – plate 31

Subprovince 2 – Supplemental Framework
1. 1,000 cfs diversion at Lac des Allemands.
2. 1,000 cfs diversion at Donaldsonville.
3. 1,000 cfs diversion at Pikes Peak.
4. 1,000 cfs diversion at Edgard.
5. Sediment delivery via pipeline at Myrtle Grove.
6. 5,000 cfs diversion at Myrtle Grove.
7. 60,000 cfs diversion at Boothville with sediment enrichment.
8. Barrier Island Restoration at Barataria Shoreline (3,000').
9. Reauthorization of Davis Pond.
10. Marsh creation at Wetland Creation and Restoration Feasibility Study sites.
11. Mississippi River Delta Management Study.
12. Third Delta (Preliminary designs, implementation costs, and benefits that were developed for this analysis would require additional detailed study to verify accuracy prior to implementation).

- **1,000 cfs diversion at Lac des Allemands**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands through Bayou Becnel. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Donaldsonville**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into upper Bayou Verret. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Pikes Peak**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Bayou Chevreuil. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **1,000 cfs diversion at Edgard**. This feature provides for a 1,000 cfs diversion at 50 percent duration river stage diverted into Lac des Allemands through Bayou Fortier. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **Sediment delivery via pipeline at Myrtle Grove**. This feature provides for sediment delivery via sediment mined from Mississippi River. Required dredging volume corresponding to a net yield of approximately 29 wetland acres per year.
- **5,000 cfs diversion at Myrtle Grove**. This feature provides for a 5,000 cfs diversion at 50 percent duration river stage diverted into the Bayou Dupont area. Annual diversion corresponds to annual river stage hydrograph, controlled structure.
- **60,000 cfs diversion at Boothville with sediment enrichment.** This feature provides for a 60,000 cfs diversion at 50 percent duration river stage into the Yellow Cotton / Hospital Bay area. Annual diversion corresponds to annual river stage hydrograph, uncontrolled diversion.
- **Barrier Island restoration at Barataria Shoreline.** Mining of offshore sediment sources to reestablish barrier islands. Based on designs developed in the LCA Barrier Island Restoration study. Option assumes a 3,000-foot island footprint.
- **Reauthorization of Davis Pond.** Since its construction in 2002, the Davis Pond structure has been operated as a salinity control measure, with freshwater introductions ranging between 1,000 cfs to 10,000 cfs. The primary purpose of the Davis Pond project has been to maintain salinity gradients in the central portion of the Barataria Basin. The proposed LCA restoration feature would seek a re-authorization of the Davis Pond project purpose to include wetland creation and restoration, thereby altering the project's operational framework and increasing the freshwater introduction rate to 5,000 cfs on average.
  Prior to the implementation of the project, the area experienced wetland deterioration due to subsidence, a lack of freshwater circulation, saltwater intrusion, and a lack of nourishment through the introduction of new sediments and nutrients. Today, wetland degradation continues due to subsidence and a paucity of sediment and nutrients to nourish the wetland communities.
- **Marsh creation at Wetland Creation and Restoration Feasibility Study sites**. Sediment mined from Mississippi River placed in the sites along Bayou Lafourche, required dredging volume corresponding to a net yield of approximately 220 wetland acres per year.
- **Mississippi River Delta Management Study.** The study is to greatly increase the deposition of Mississippi River sediments on the shallow continental shelf, while insuring navigation interests. Sediment, nutrients and fresh water would be re-directed to restore

the quality and sustainability of the Mississippi River Delta Plain, its coastal wetland complex, and the Gulf of Mexico.

- **Third Delta (**Preliminary designs, implementation costs, and benefits that were developed for this analysis would require additional detailed study to verify accuracy prior to implementation**).** This feature provides for a 120,000 cfs diversion at Bayou Lafourche. Approximately 240,000 cfs at maximum river stage diverted into a newly constructed conveyance channel (parallel to Bayou Lafourche), diversion corresponds to annual river stage hydrograph, diverted flow would be divided equally between the Barataria and Terrebonne hydrologic basins, controlled structure. Sediment enrichment assumes use of 30-inch dredge at capacity for three months. Three month yield = 6,293, 000 yd^3 at an average depth of 5 feet with 50 percent compaction and 80 percent retention. This corresponds to approximately 175-ppm additional sediment in the diversion at 200,000 cfs.

Subprovince 3 - Supplemental Framework (modified R1)

For Subprovince 3, the overall restoration approach is centered on reducing wetland losses and maximizing wetland creation through better management of the Atchafalaya River water flows. The Atchafalaya River is a distributary of the Mississippi River and is, in essence, a huge freshwater diversion that currently supports delta building and wetland creation at the Wax Lake Outlet and at the mouth of the Lower Atchafalaya River. In addition, the Atchafalaya River nourishes the wetlands in the Teche/Vermilion Basin, located in the western portion of the subprovince. As a result, this basin contains some of the healthiest wetlands in Louisiana's coastal area, fueled by the inputs of sediments and nutrients from the Atchafalaya River. Thus, the LCA Ecosystem Restoration Study proposes few rehabilitation features for wetland areas immediately adjacent to and areas to the west of the Atchafalaya River, where wetland communities are predominantly healthy. Instead, the study focuses attention on 1) maximizing the on-going deltaic development at the Wax Lake Outlet and the mouth of the Lower Atchafalaya River, 2) maximizing Atchafalaya River flows to the degraded wetlands that lie on the fringe of its riverine influence, primarily the Terrebonne Basin wetlands, which are located to the far east of the Atchafalaya River and to the west of Bayou Lafourche, and 3) reducing marine processes from the Gulf of Mexico on the gulf shorelines. The eastern half of the Terrebonne Basin is the furthest removed from any active river system and is experiencing some of the highest land loss rates within the Deltaic Plain, due mainly to a high subsidence rate, altered hydrology associated with the damming of Bayou Lafourche, and the dredging of oil and gas canals and the Houma Navigation Canal. Land loss in Subprovince 3 is so severe that it experiences the highest land loss along the coast.

The ultimate performance of almost every individual feature in Subprovince 3 is closely tied to the successful implementation of other restoration features in the subprovince. For example, one restoration feature involves the construction and operation of the Houma Navigation Canal Lock to stem the rate at which Atchafalaya River flows in the Terrebonne Basin are shunted to the Gulf of Mexico, bypassing wetlands in need of freshwater, nutrients and sediments. With a reduced rate, other restoration features to the north of the Houma Navigation Canal Lock can use the recouped freshwater and introduce it into wetland areas of critical concern. Without the

Houma Navigation Canal Lock, the performance of several restoration features in the subprovince is compromised and the synergistic benefits gained from their collective implementation are reduced. Supplemental Framework features in Subprovince 3 include:

Subprovince 3 - Supplemental Framework (modified R1) - plate 32

Subprovince 3 – Supplemental Framework (modified R1)
1. Bayou Lafourche 1,000 cfs pump.
2. Relocate the Atchafalaya navigation channel.
3. Increase sediment transport down Wax Lake Outlet.
4. Study the modification of the Old River Control Structure (ORCS) operational scheme to benefit coastal wetlands.
5. Convey Atchafalaya River water to Terrebonne marshes.
6. Freshwater introduction via Blue Hammock Bayou.
7. Penchant Basin Plan.
8. Maintain northern shore of East Cote Blanche Bay
9. Rebuild Pointe Chevreuil reef.
10. Restore Terrebonne barrier islands.
11. Multipurpose operation of the Houma Navigation Canal (HNC) Lock.
12. Maintain land bridge between Caillou Lake and Gulf of Mexico.
13. Stabilize gulf shoreline
14. Maintain land bridge between Bayous Dularge and Grand Caillou.

- **Bayou Lafourche 1,000 cfs pump.** A flow of 1000 cfs would be pumped into Bayou Lafourche. The targeted wetland benefit area is the area between Bayous Lafourche and Terrebonne, south of the GIWW. The flow would be continuous and would freshen the wetlands and would reduce loss rates.
- **Relocate the Atchafalaya navigation channel.** This feature consists of relocating the Atchafalaya navigation channel. The Navigation Channel route through the delta has been identified as the greatest impediment to the delta's growth. By rerouting the Channel and using a passive hydraulic structure at the point of departure in the Lower Atchafalaya River, river sediment would be used more efficiently in the delta lobes.
- **Increase sediment transport down Wax Lake Outlet.** Increase sediment transport down Wax Lake Outlet by extending the outlet northward through Cypress Island to connect to the Atchafalaya Main Channel. Currently, the Wax Lake Outlet (WLO) flows pass over the relatively shallow Six Mile Lake before entering the outlet. This feature would connect the deep outlet directly to the deep Atchafalaya Main Channel thereby increasing more bed load sediments to be transported to the WLO delta. Increased delta growth was projected by the LSU CELSS Western Bays Model.
- **Study the modification of the Old River Control Structure (ORCS) operational scheme to benefit coastal wetlands.** This proposal would alter the ORCS operational framework with a goal of increasing the sediment load to be transported by the Atchafalaya River. An approximate 20 percent increase in delta growth was proposed as the feature objective but would be refined upon detailed evaluation of the feature. Detailed studies of this proposal would include determination of impacts (beneficial and

adverse) to the interior of the Atchafalaya Basin, the degree to which flow and sediment distributions would be required, and the increased costs of maintaining the flood control, navigation, and environmental features along the Lower Mississippi, Red and Atchafalaya Rivers.

- **Convey Atchafalaya River water to Terrebonne marshes.** Increase Atchafalaya River flows to Terrebonne Basin by a diversion in the Avoca Island Levee, repairing eroding banks of the GIWW, and enlarging constrictions in the GIWW below Gibson and in Houma. Ideally, half of Bayou Shaffer flow, or more, would be diverted (via an open unstructured cut through the levee) into Avoca Lake to maximize land building. The percent flow diverted would be reduced if high water level impacts in the Penchant marshes would be too great. A constriction structure in Bayou Shaffer would be installed downstream of the levee cut to force flow into Avoca Lake. Several new channels connecting the eastern portions of Avoca Lake with Bayou Chene would be constructed to facilitate the distribution of sediments (land-building) across a wider portion of the lake bottom. Introduced flows leaving Avoca Lake would be readily carried southward down Bayou Penchant, increasing its sediment load, compared to the existing conditions where water has to back-up to Bayou Penchant through the Avoca Island Cutoff Channel. In lieu of a diversion from Bayou Shaffer into Avoca Lake, an alternative might be to partial or fully breach the Avoca Island Extension Levee where Bayou Shaffer runs adjacent to the Avoca Island Cutoff Canal. This cut would also involve an open armored channel.

  In conjunction with the Bayou Shaffer diversion, sections of eroded dredged material banks along the GIWW would be repaired to contain flows for more efficient delivery to areas of need further east and to halt boat wake-induced erosion of shoreline marshes.

  In conjunction with the above features, and to better carry water eastward to brackish areas of need, the GIWW constrictions would be enlarged. In Bayou Chene, the channel is roughly 12,000 sq. feet. But between Bayou Black and Bay Wallace, the channel is reduced to 5,500 sq. feet. The most severe constriction is in Houma where cross-section is reduced to as little as 2,200 sq. feet at the Bayou Terrebonne junction. An initial concept is to construct and maintain an 8,000 sq. foot channel through Houma. This concept is very closely linked with project number 5a above and would be considered only if that project shows that the presently available freshwater can be fully utilized through features to introduce it into needy marshes south of the GIWW. This project would involve dredging to enlarge channel cross-section and relocations of businesses and utilities, together with bridge modifications as needed. The Houma GIWW tunnel may limit the degree to which the channel can be enlarged at the tunnel location.
- **Freshwater introduction via Blue Hammock Bayou.** Increase Atchafalaya Flow to SW Terrebonne via Blue Hammock Bayou. The project would increase the distribution of Atchafalaya flows in Fourleague Bay to Lake Merchant wetlands by increasing the cross-section of Blue Hammock Bayou. Marsh would be created with material dredged. Grand Pass and Buckskin Bayou, the outlets of Lake Merchant, would be reduced in cross section to increase the retention of Atchafalaya nutrients, sediment, and freshwater.
- **Penchant Basin Plan.** Reduce excessive water levels in the upper Penchant Subbasin by implementing the Penchant Basin Plan. The Penchant Basin Plan would increase the

efficiency of Bayou Penchant to convey flows from the area wetlands as Atchafalaya River stages fall after spring floods. Increased outlet capacities would utilize the flows to increase the circulation and retention to wetlands in the more tidal zone below the large fresh floating marsh zone. Wetlands losses would be reduced in both zones (LSU CELSS model results).

- **Maintain northern shore of East Cote Blanche Bay.** Protect North shore of East Cote Blanche Bay from Point Marone to Jackson Bayou. Approximately 23,600 feet of bay shoreline would be stabilized to protect the interior wetland water circulation patterns in the Cote Blanche Wetlands CWPPRA project. The project was designed to increase the retention time of the Atchafalaya flows moving from the GIWW to East Cote Blanche Bay. Shoreline erosion is thought to have increased with dredging of shell reefs between the bay and gulf.
- **Rebuild Point Chevreuil Reef.** This feature provides for rebuilding historic Point Chevreuil Reef toward Marsh Island. Rehabilitate the Bayou Sale natural levee between Point Chervil and the gulf. The natural levee would be rebuilt in the form of a shallow sub aqueous platform, small islands, and/or reefs. The historic shell reefs were removed by shell dredging. The feature would be about 12 miles long and would deflect some of Atchafalaya flow and sediments from entering East Cote Blanche Bay resulting in slightly higher salinities in the bay. Overall, this feature would restore some semblance of historic hydrologic conditions in the Teche/Vermilion Basin.
- **Restore Terrebonne barrier islands.** This feature provides for the restoration of the Timbalier and Derrieres barrier island chains (Alternative a). This would simulate the 1890 condition with fewer breaches than now. The islands would be widened to 600m and the dune crest elevation would be 2.7 m (NGVD).
- **Multipurpose operation of the Houma Navigation Canal (HNC) Lock.** Multi-purpose operation of the Houma Navigation Canal Lock and related Morganza to the Gulf Hurricane Protection Project features. Improve the distribution of Atchafalaya flows through the HNC to the west in Falgout Canal, to the marshes east and west of the HNC, to the marshes south of the Lake Boudreaux Basin, and to the Grand Bayou marshes east of Bayou Point Au Chien. Structures would be operated during periods of low freshwater flows to reduce intrusion of high salinity water into low salinity wetlands.
- **Maintain land bridge between Caillou Lake and the Gulf of Mexico.** Maintain the land bridge between the gulf and Caillou Lake by shore protection in Grand Bayou DuLarge to minimize salinity intrusion. This project would involve 43,000 feet of rock armoring or marsh creation to plug/fill broken marsh areas on the west bank of lower Grand Bayou DuLarge, where a new channel is threatening to breach the bayou bank and allow the establishment of a new connection with Caillou Lake. Some gulf shore armoring would likely be needed to protect these features from erosion on the gulf shoreline. A more systemic and comprehensive solution would involve a much greater amount of gulf shoreline armoring, especially toward the west where shoreline retreat and loss of shoreline oyster reefs has allowed for increased water exchange between the gulf and the interior waterbodies (between Bay Junop and Caillou Lake). Some of the newly opened channels would be closed to restore historic cross-sections of exchange points. By reducing marine influences in these interior areas, these features might also allow increased riverine influences from Four League Bay to benefit area marshes.

- **Stabilize gulf shoreline.** This feature provides for stabilizing the gulf shoreline of Point Au Fer Island. Stabilize 81,500 feet of the gulf shoreline of Point Au Fer I to prevent direct connections between the gulf and interior water bodies. The gulf shoreline erosion would be arrested along the island thereby reducing the direct losses from the erosion. Indirectly, island marsh loss would be reduced by preventing the interior water circulation avenues from being connected directly to the gulf rather than Atchafalaya Bay and Fourleague Bay. The fresh nutrient and sediment rich bay waters provide for wetland needs much better than the high salinity gulf waters.
- **Maintain land bridge between Bayous Dularge and Grand Caillou.** Construct a land bridge between Bayous DuLarge and Grand Caillou south of Falgout Canal and northeast of Caillou Lake. A grid of numerous trenasses has artificially increased the hydrologic connection between interior marshes with Caillou Lake and adjoining waterbodies. This problem would be addressed by depositing hydraulically dredged material to close the trenasses and areas of broken marsh to create a continuous 300-foot-wide and 21,000-foot-long berm of "high marsh" extending from Bayou Grand Caillou to Bayou DuLarge (leaving Bayou Sauveur open). This berm would separate the higher healthy brackish/saline marshes bordering the northeast end of Caillou Lake from the deteriorating inland intermediate/brackish marshes. It would also allow the freshwater flowing down the HNC and Bayou Grand Caillou to have a greater influence on interior marshes through existing water exchange points along Bayou Grand Caillou, north of the proposed land bridge.

Subprovince 4 - Supplemental Framework (modified E2)

For Province 4, the overall restoration approach is centered on reducing salinity impacts on coastal wetlands. Under this approach, salinity controls (e.g., existing and newly constructed salinity control structures) around Calcasieu Lake and the eastern portion of Sabine Lake would be established and/or modified to reduce tidal influences between the Gulf of Mexico and the interior coastal wetlands. In addition, marsh creation efforts would be undertaken in interior open water surrounding Calcasieu Lake, and excess freshwater would be diverted south of Highway 82 to reduce the ponding of water on wetlands within the Mermentau Lakes Subbasin, and more importantly, to reduce the salinities in the Chenier subbasin wetlands. Thus, the restoration strategies for the subprovince are wetland creation via beneficial use/dedicated dredging of sediments, and hydrologic restoration, which would reduce wetland losses and improve wetland functionality and sustainability in the coastal marshes.

There are several opportunities that may facilitate wetland restoration in this subprovince. First, subsidence rates in the subprovince are comparatively low, therefore tidal influences and saltwater intrusion remain the primary factors adversely impacting the long-term wetland sustainability. Second, dredged material is readily available from navigation channels, especially the Calcasieu Ship Channel, to create new wetlands and nourish existing ones. Supplemental Framework features in Subprovince 4 include:

Subprovince 4- Supplemental Framework (modified E2) – plate 33

Subprovince 4 – Supplemental Framework (modified E2)
1. Salinity control at Oyster Bayou.
2. Salinity control at Long Point Bayou.
3. Salinity control at Black Lake Bayou.
4. Salinity control at Alkali Ditch.
5. Modify existing Cameron-Creole Watershed Control structures.
6. East Sabine hydrologic restoration.
7. Salinity control at Black Bayou.
8. Salinity control at Highway 82 Causeway.
9. Freshwater introduction at Pecan Island.
10. Freshwater introduction at Rollover Bayou.
11. Freshwater introduction at Highway 82.
12. Freshwater introduction at Little Pecan Bayou.
13. Freshwater introduction at South Grand Chenier.
14. Gulf shoreline stabilization.
15. Calcasieu ship channel beneficial use.
16. Black Bayou Bypass culverts.
17. Chenier Plain Freshwater Management and Allocation Reassessment.

- **Salinity control at Oyster Bayou**. Salinity control in Oyster Bayou with a gated structure or rock weir. Location in Oyster Bayou about 1 mile west of Calcasieu Ship Channel 100-150 feet wide X 10 feet deep; with an approximately 15-20 feet wide X 4 feet deep boat bay.
- **Salinity control at Long Point Bayou**. Salinity control in Long Point Bayou with a gated structure or rock weir located in Long Point Bayou north of Sabine NWR near Hwy 27 west of Calcasieu Ship Channel (Existing dimensions equal 40 feet wide X 5 feet deep; structure approximate dimensions are 10 to 15 feet wide X 4 feet deep boat bay).
- **Salinity control at Black Lake Bayou.** Salinity control in Black Lake Bayou with gated structure or rock weir with boat bay. Location in Black Lake Bayou north of Hackberry near Calcasieu Ship Channel (Existing bayou dimensions are approximately 150 feet wide X10 feet deep; gated structure or rock weir approximate dimensions equal 25 to 50 feet wide X 6 to 8 feet deep boat bay).
- **Salinity control at Alkali Ditch**. Salinity control at the Alkali Ditch, northwest of Hackberry, LA at the GIWW, with gated structure or rock weir with barge bay (Existing dimensions are approximately 150 to 200 feet wide X 8 to10 feet deep; structure or weir with approximate dimensions 70 feet wide X 8 feet deep.
- **Modify existing Cameron-Creole Watershed Control Structures**. The Cameron-Creole watershed project constructed in 1989 consists of 5 large concrete water control structures and a 16 mile-long levee along the shoreline of Calcasieu Lake. Three of the five structures (Grand Bayou, Bois Connine Bayou, and Lambert Bayou) are adjustable structure with slide gates and the remaining two (Mangrove Bayou and No Name Bayou) are fixed crest weir structures. The fixed crest weir sill heights may be set too high. This higher setting could be contributing to the impoundment problem within Cameron-Creole marshes adjacent to those structures. If the weir sills for these two structures could be

modified to lower weir crests reduced impoundment, greater water flow and increased fisheries access independent of salinity control at Calcasieu Pass.

- **East Sabine hydrologic restoration**. East Sabine Lake Hydrologic Restoration Project between Sabine Lake and Sabine NWR Pool 3; salinity control structures at Willow Bayou, Three Bayou, Greens Bayou and Right Prong of Black Bayou, terracing, Sabine Lake shoreline protection, & smaller structures.
- **Salinity control at Black Bayou**. Salinity control structure with boat bay at mouth of Black Bayou (either gated structure or a rock weir), located at the intersection of Black Bayou and the northeastern shoreline of Sabine Lake (Existing bayou dimensions are 150 to 200 feet wide X 10 feet deep).
- **Salinity control at Highway 82 Causeway**. This feature provides rock weir at Hwy 82 Causeway located in the southern portion of Sabine Lake north of Sabine Pass and the Sabine-Neches Waterway Existing dimensions equal approximately 3,400 feet wide by approximately 4 feet deep except at the approximate 10 feet deep center channel.
- **Freshwater introduction at Pecan Island**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin.
- **Freshwater introduction at Rollover Bayou**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin.
- **Freshwater introduction at Highway 82**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin at the Highway 82 area between Rollover Bayou and Superior Canal to the eastern portion of Rockefeller Refuge.
- **Freshwater introduction at Little Pecan Bayou.** This feature provides for Movement of "excess" freshwater from the Mermentau Basin Lake Subbasin across Hwy 82 to the Chenier Subbasin west of Rockefeller Refuge at the Thibodeaux Bridge.
- **Freshwater introduction at South Grand Chenier**. This feature provides for movement of "excess" freshwater from the Mermentau Basin Lakes Subbasin from the Mermentau River across Hwy 82 to the Chenier Subbasin Hog Bayou Watershed.
- **Gulf Shoreline Stabilization**. This feature provides for gulf shoreline stabilization from Mermentau Ship Channel to near Rollover Bayou. Gulf Shoreline Stabilization using rock foreshore dikes, offshore reefs, or segmented breakwaters. Located from Mermentau Ship Channel to near Rollover Bayou east of Rockefeller Refuge. Foreshore dikes 25 to 50 feet gulfward of shore in shallow water 1 to 3 feet deep with gaps every 1,000 feet. Subaqueous rock reef placed 150 to 100 feet gulfward from shore in 2 to 5 feet depth of water. Segmented breakwaters designed similar to Holly Beach Breakwaters placed closer to shore (100 feet or closer) and with narrower gaps (approximately 250 feet long with 50 feet gaps).
- **Calcasieu Ship Channel Beneficial Use**. This feature provides for beneficial use of dredged material from the Calcasieu Ship Channel.
- **Black Bayou Bypass culverts.** This feature provides for the replacement of the Calcasieu Lock in the GIWW west of the Hwy 384 Bridge and use old lock for freshwater introduction to the upper Calcasieu estuary from the Mermentau Basin. This feature also provides for freshwater introduction via the Black Bayou Culverts feature at the intersection of Black Bayou and Hwy 384.

- **Chenier Plain Freshwater Management and Allocation Reassessment.** This restoration feature requires detailed investigations involving water allocation needs and trade-off analysis in the eastern Chenier Plain, including the Teche/Vermillion Basin, to provide for wetland restoration, and support continued agriculture and navigation in the region.

The following pages (A-70 to A-104) present the plates for this attachment. The locations of features identified in the following plates were used for costing purposes. The specific locations of restoration features will be identified during the preparation of detailed project implementation reports

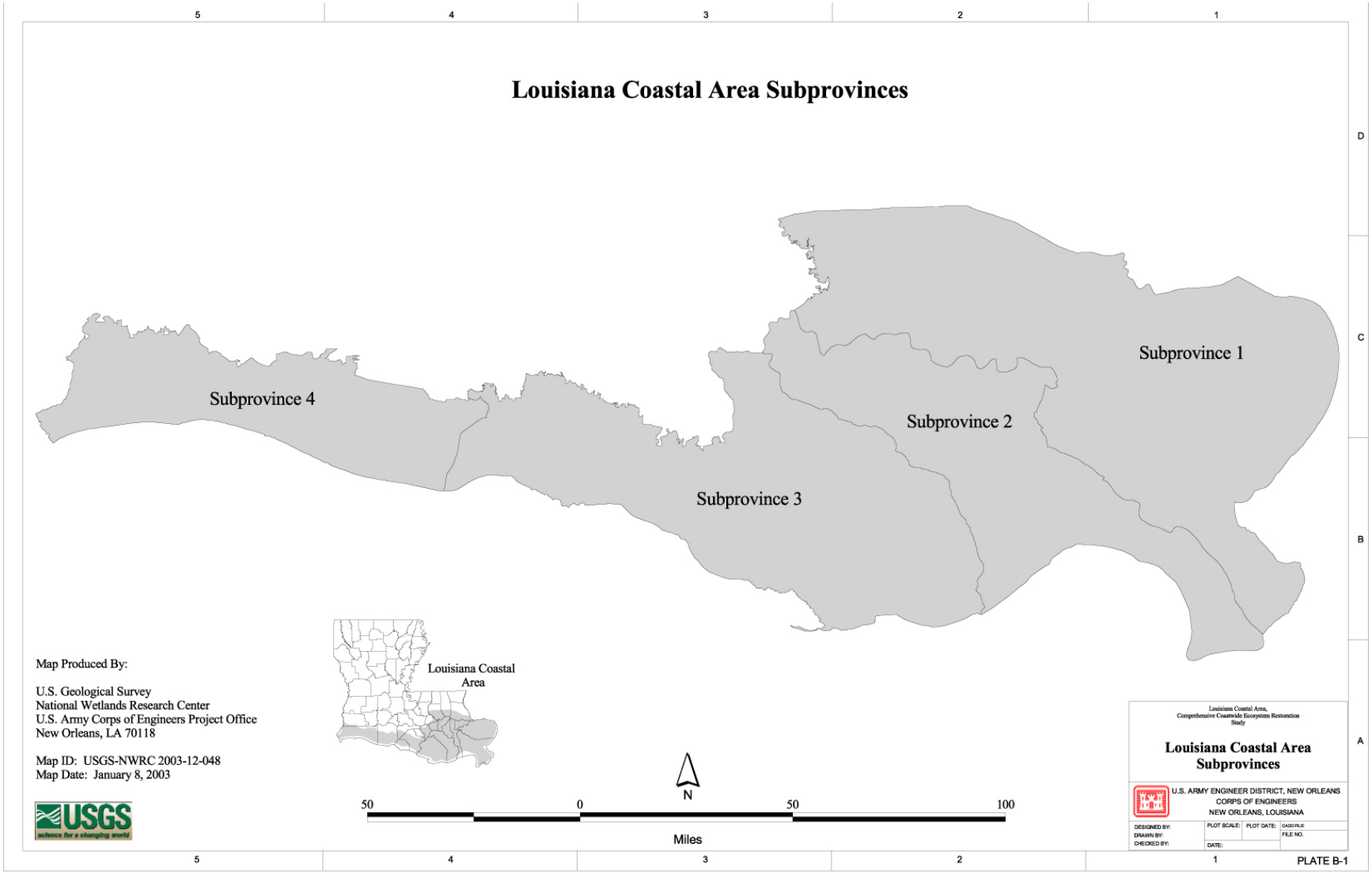
Louisiana Coastal Area Subprovinces
Subprovince 1
Subprovince 2
Subprovince 3
Subprovince 4
Louisiana Coastal Area
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-048
Map Date: January 8, 2003
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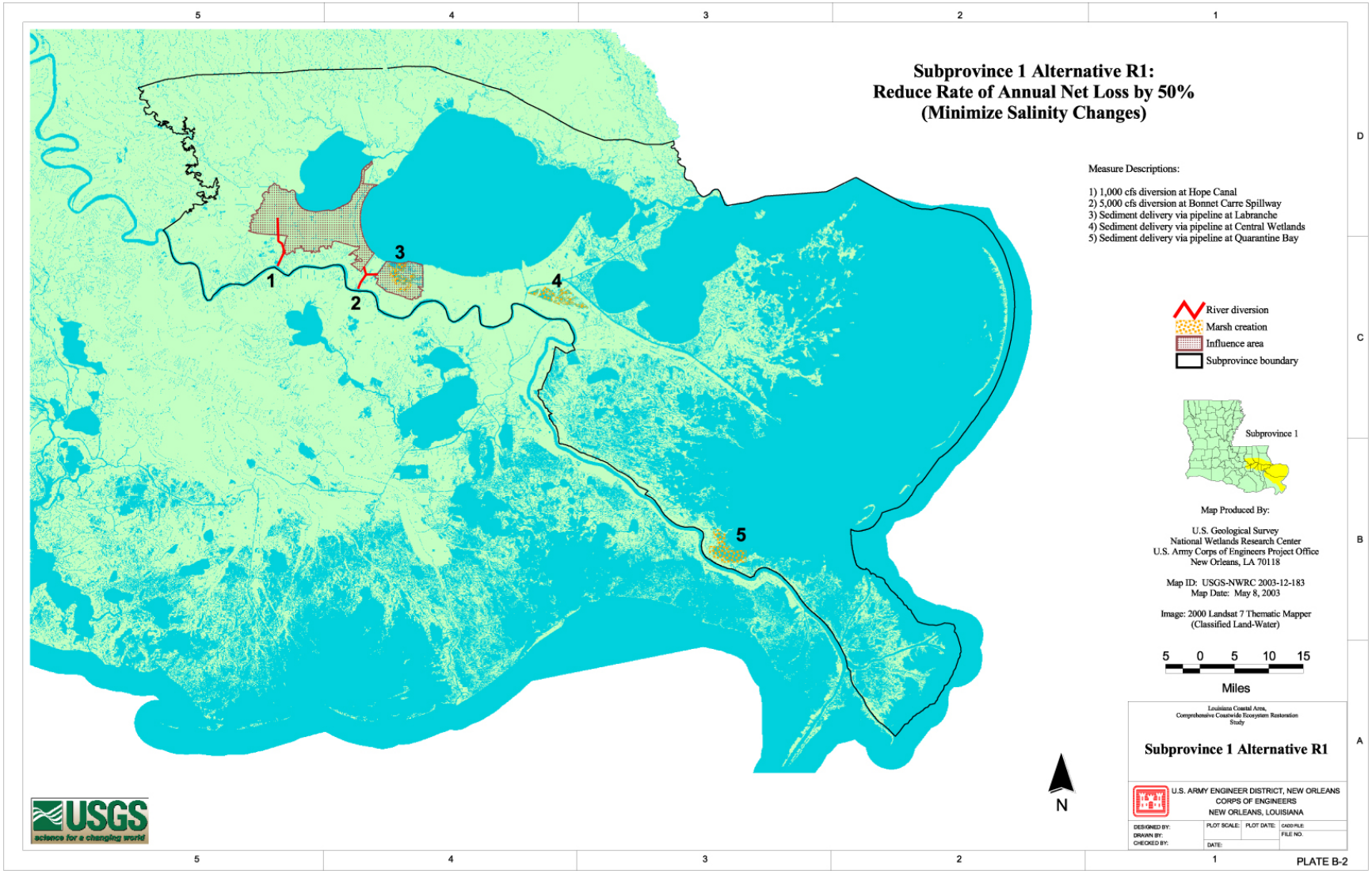
PLATE B-1


Subprovince 1 Alternative R1:
Reduce Rate of Annual Net Loss by 50%
(Minimize Salinity Changes)
Measure Descriptions:
1) 1,000 cfs diversion at Hope Canal
2) 5,000 cfs diversion at Bonnet Carre Spillway
3) Sediment delivery via pipeline at Labranche
4) Sediment delivery via pipeline at Central Wetlands
5) Sediment delivery via pipeline at Quarantine Bay
River diversion
Marsh creation
Influence area
Subprovince boundary
Subprovince 1
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-183
Map Date: May 8, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
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Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 1 Alternative R1
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
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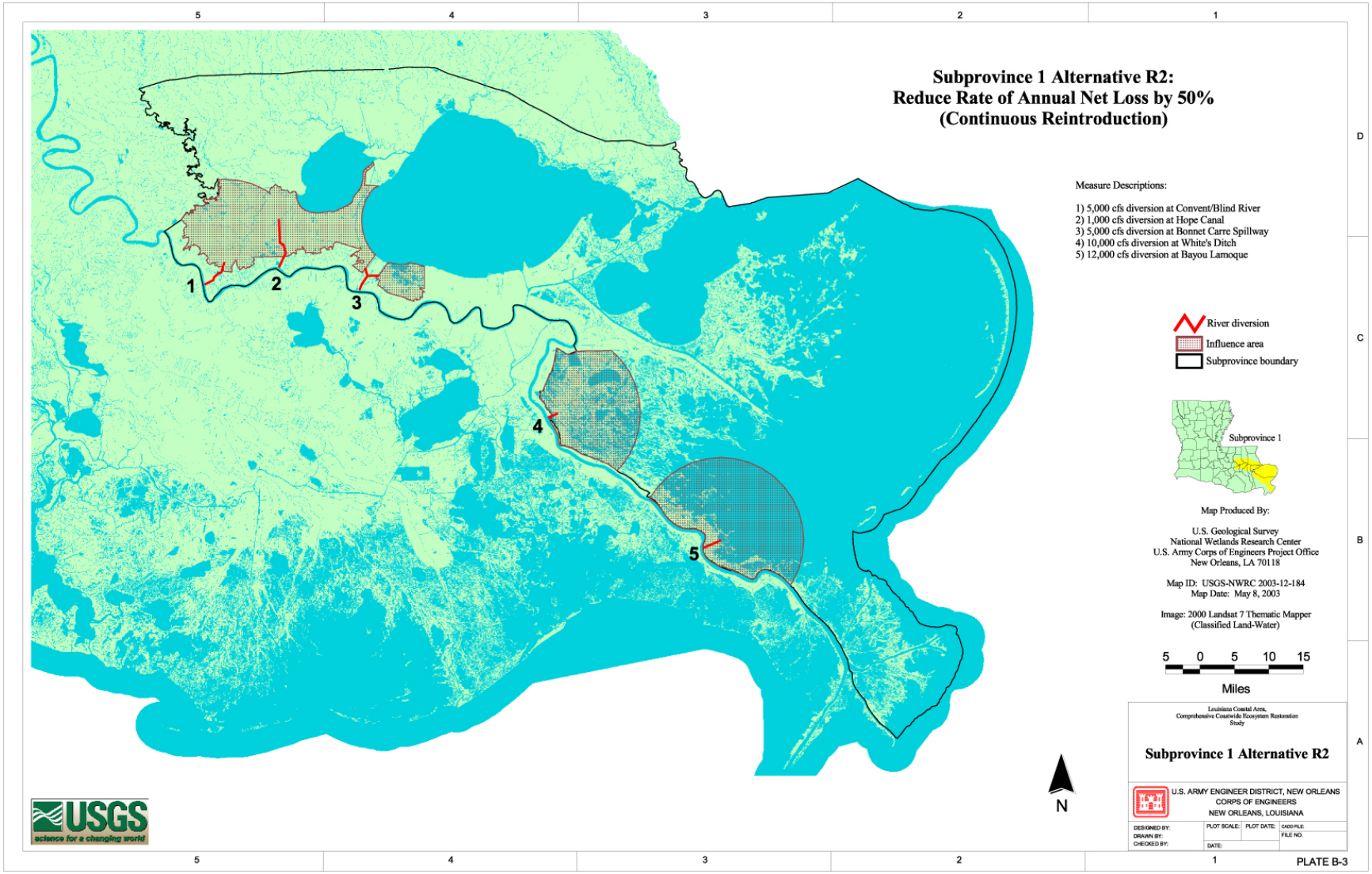
PLATE B-2


Subprovince 1 Alternative R2:
Reduce Rate of Annual Net Loss by 50%
(Continuous Reintroduction)
Measure Descriptions:
1) 5,000 cfs diversion at Convent/Blind River
2) 1,000 cfs diversion at Hope Canal
3) 5,000 cfs diversion at Bonnet Carre Spillway
4) 10,000 cfs diversion at White's Ditch
5) 12,000 cfs diversion at Bayou Lamoque
River diversion
Influence area
Subprovince boundary
Subprovince 1
Map Produced By:
U.S. Geological Survey
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U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-184
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Subprovince 1 Alternative R2
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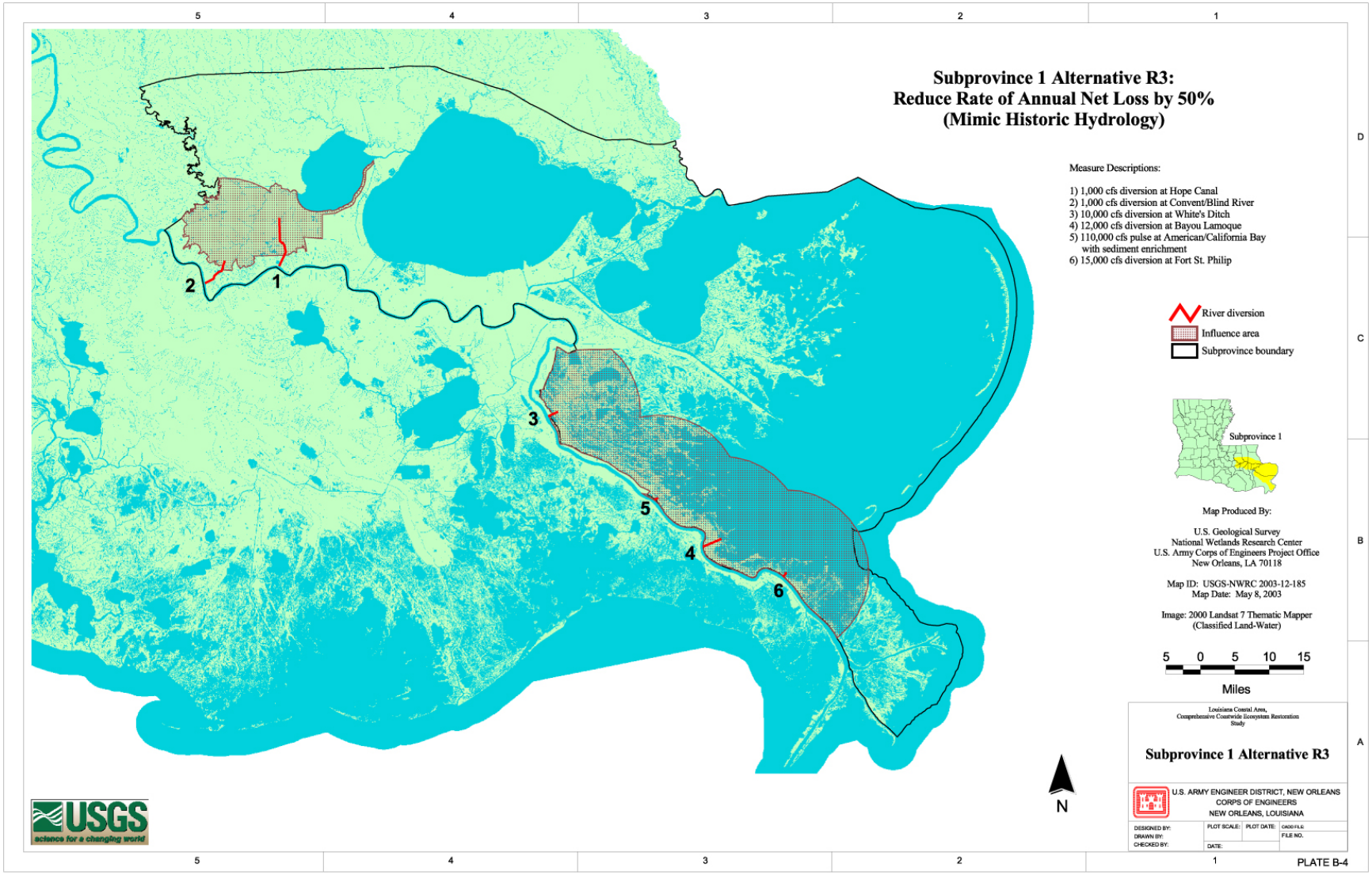
PLATE B-3


Subprovince 1 Alternative R3:
Reduce Rate of Annual Net Loss by 50%
(Mimic Historic Hydrology)
Measure Descriptions:
1) 1,000 cfs diversion at Hope Canal
2) 1,000 cfs diversion at Convent/Blind River
3) 10,000 cfs diversion at White's Ditch
4) 12,000 cfs diversion at Bayou Lamoque
5) 110,000 cfs pulse at American/California Bay with sediment enrichment
6) 15,000 cfs diversion at Fort St. Philip
River diversion
Influence area
Subprovince boundary
Subprovince 1
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-185
Map Date: May 8, 2003
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Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 1 Alternative R3
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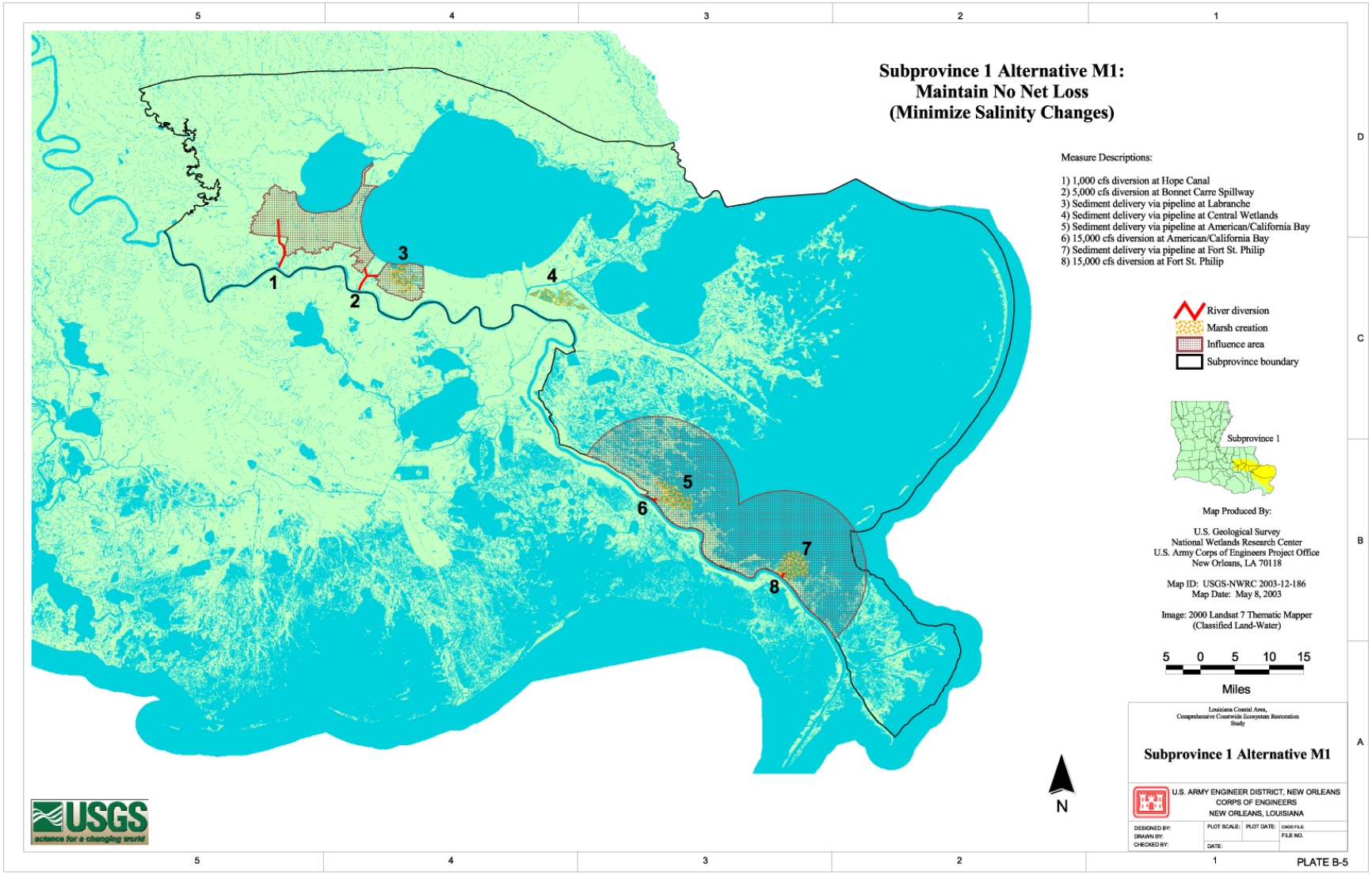
PLATE B-4


Subprovince 1 Alternative M1:
Maintain No Net Loss
(Minimize Salinity Changes)
Measure Descriptions:
1) 1,000 cfs diversion at Hope Canal
2) 5,000 cfs diversion at Bonnet Carre Spillway
3) Sediment delivery via pipeline at Labranche
4) Sediment delivery via pipeline at Central Wetlands
5) Sediment delivery via pipeline at American/California Bay
6) 15,000 cfs diversion at American/California Bay
7) Sediment delivery via pipeline at Fort St. Philip
8) 15,000 cfs diversion at Fort St. Philip
River diversion
Marsh creation
Influence area
Subprovince boundary
Subprovince 1
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-186
Map Date: May 8, 2003
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(Classified Land-Water)
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Miles
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Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 1 Alternative M1
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY:
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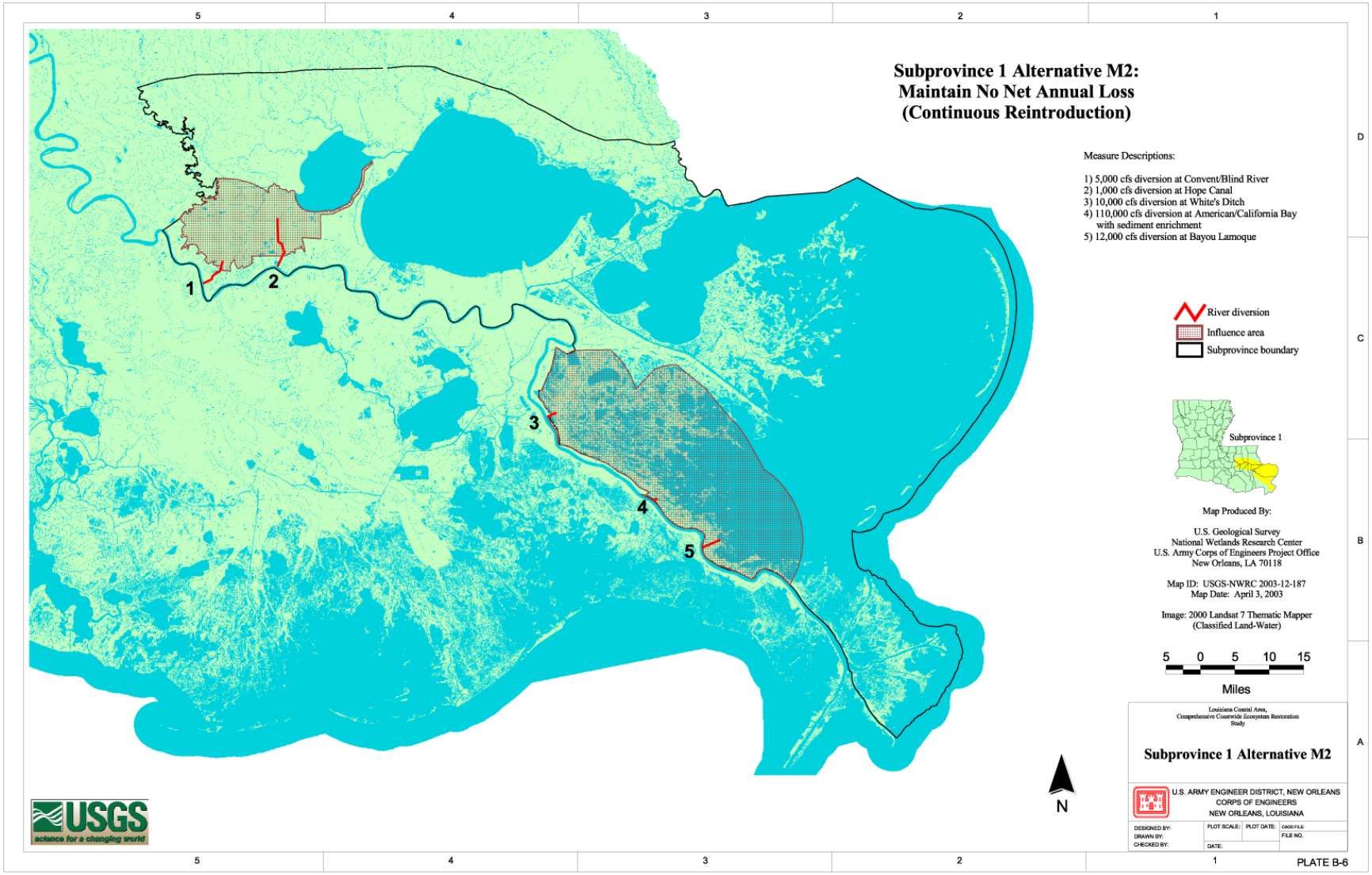
FILE NO.
DATE:
USGS
science for a changing world
PLATE B-5


Subprovince 1 Alternative M2:
Maintain No Net Annual Loss
(Continuous Reintroduction)
Measure Descriptions:
1) 5,000 cfs diversion at Convent/Blind River
2) 1,000 cfs diversion at Hope Canal
3) 10,000 cfs diversion at White's Ditch
4) 110,000 cfs diversion at American/California Bay
with sediment enrichment
5) 12,000 cfs diversion at Bayou Lamoque
River diversion
Influence area
Subprovince boundary
Subprovince 1
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-187
Map Date: April 3, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
5 0 5 10 15
Miles
N
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 1 Alternative M2
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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PLOT DATE:
CADD FILE
FILE NO.
DATE:
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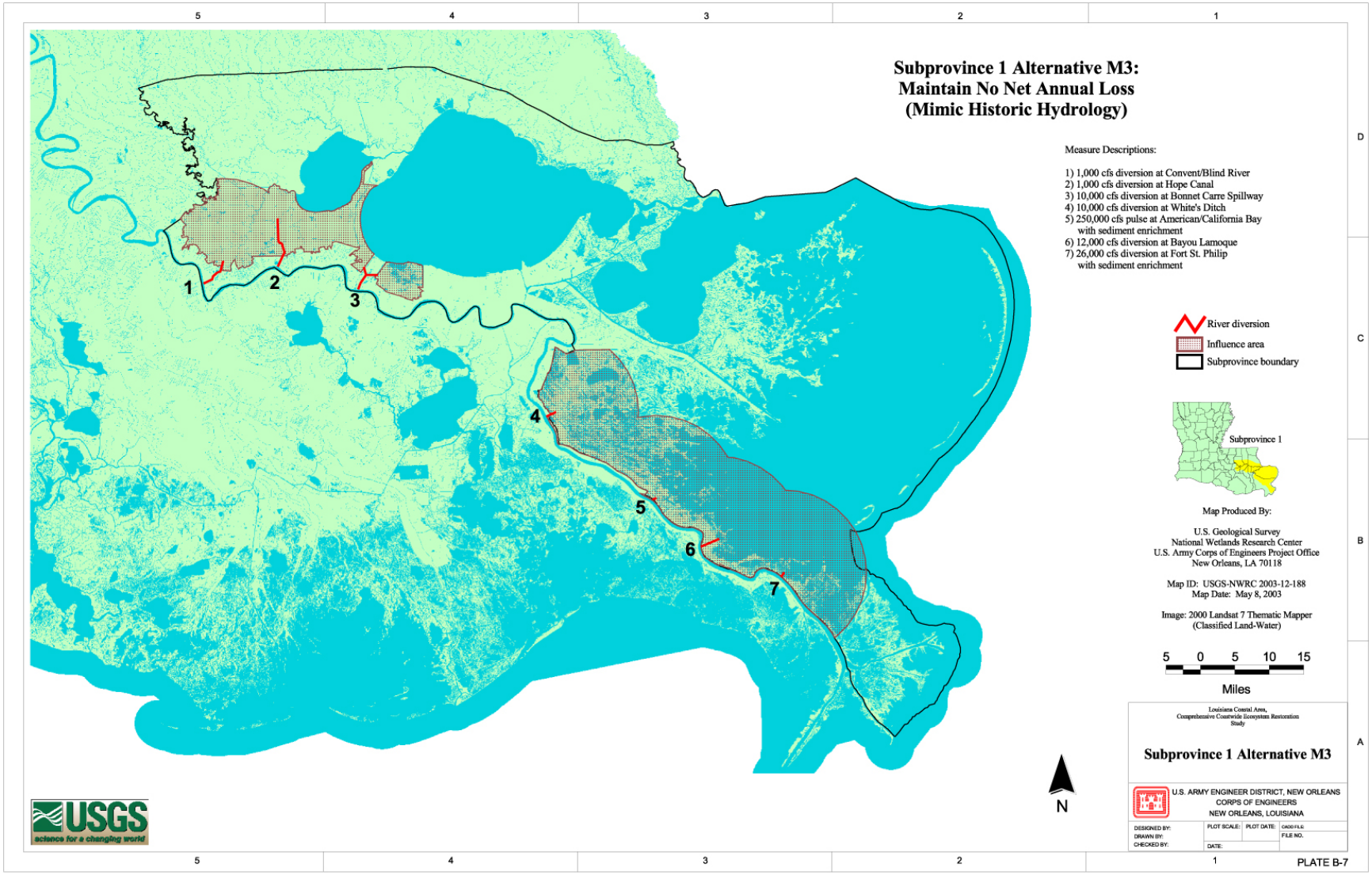
science for a changing world
PLATE B-6


Subprovince 1 Alternative M3:
Maintain No Net Annual Loss
(Mimic Historic Hydrology)
Measure Descriptions:
1) 1,000 cfs diversion at Convent/Blind River
2) 1,000 cfs diversion at Hope Canal
3) 10,000 cfs diversion at Bonnet Carre Spillway
4) 10,000 cfs diversion at White's Ditch
5) 250,000 cfs pulse at American/California Bay
with sediment enrichment
6) 12,000 cfs diversion at Bayou Lamoque
7) 26,000 cfs diversion at Fort St. Philip
with sediment enrichment
River diversion
Influence area
Subprovince boundary
Subprovince 1
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-188
Map Date: May 8, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
5 0 5 10 15
Miles
N
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 1 Alternative M3
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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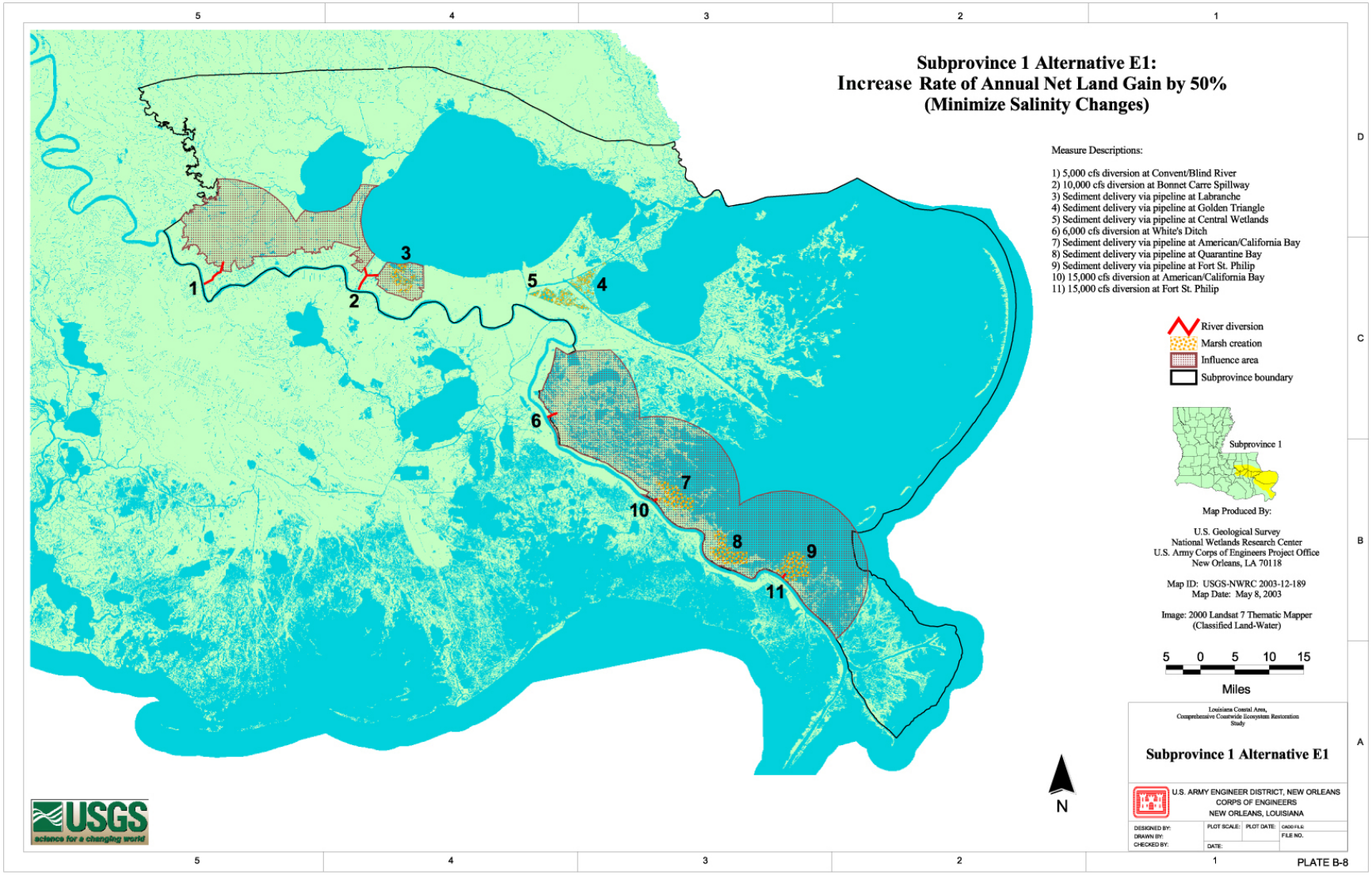
PLOT DATE:
CADD FILE
FILE NO.
DATE:
USGS
science for a changing world
PLATE B-7


Subprovince 1 Alternative E1:
Increase Rate of Annual Net Land Gain by 50%
(Minimize Salinity Changes)
Measure Descriptions:
1) 5,000 cfs diversion at Convent/Blind River
2) 10,000 cfs diversion at Bonnet Carre Spillway
3) Sediment delivery via pipeline at Labranche
4) Sediment delivery via pipeline at Golden Triangle
5) Sediment delivery via pipeline at Central Wetlands
6) 6,000 cfs diversion at White's Ditch
7) Sediment delivery via pipeline at American/California Bay
8) Sediment delivery via pipeline at Quarantine Bay
9) Sediment delivery via pipeline at Fort St. Philip
10) 15,000 cfs diversion at American/California Bay
11) 15,000 cfs diversion at Fort St. Philip
River diversion
Marsh creation
Influence area
Subprovince boundary
Subprovince 1
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-189
Map Date: May 8, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
5 0 5 10 15
Miles
N
USGS
science for a changing world
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 1 Alternative E1
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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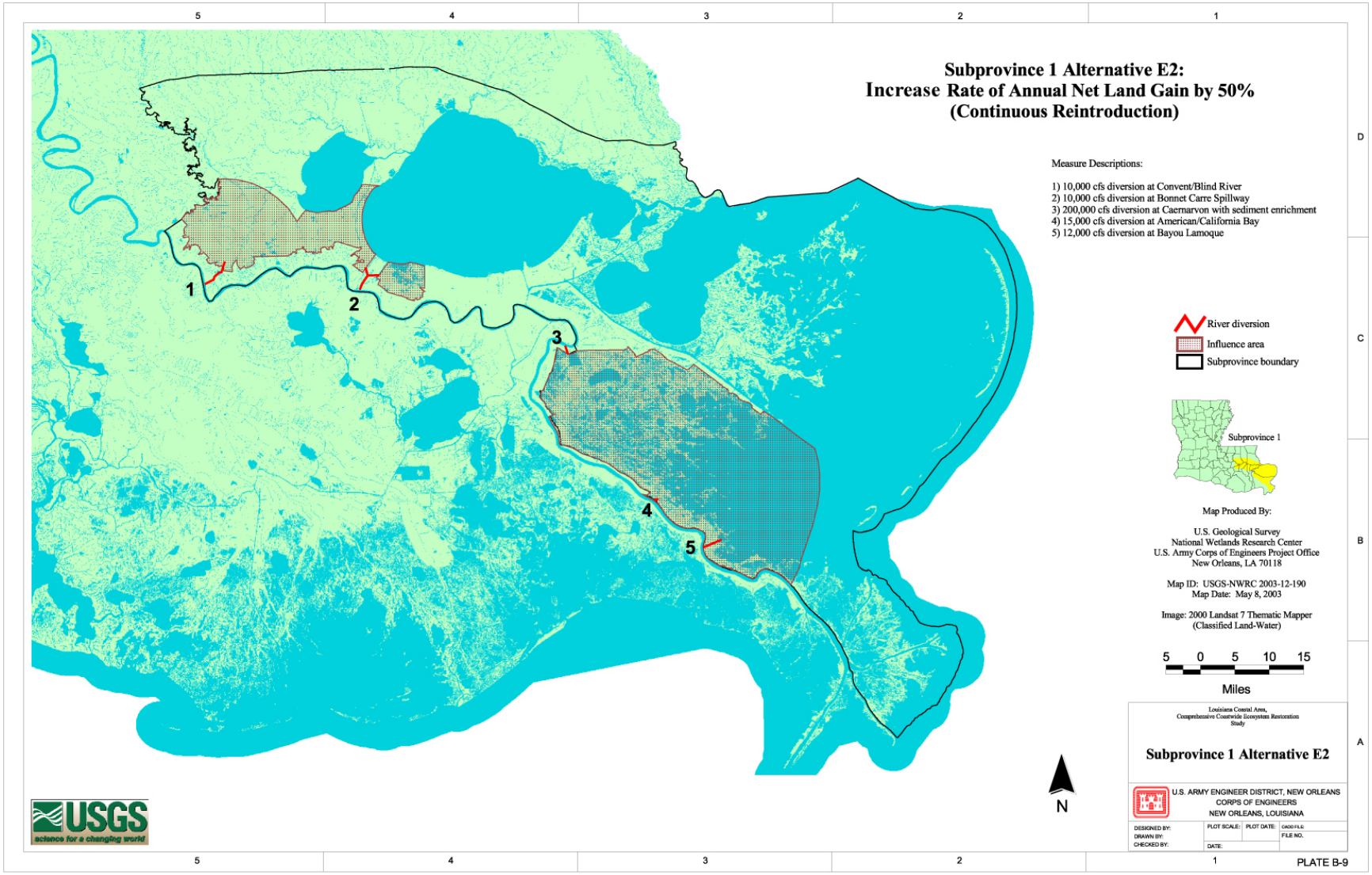
PLOT DATE:
CADD FILE
FILE NO.
DATE:
PLATE B-8


Subprovince 1 Alternative E2:
Increase Rate of Annual Net Land Gain by 50%
(Continuous Reintroduction)
Measure Descriptions:
1) 10,000 cfs diversion at Convent/Blind River
2) 10,000 cfs diversion at Bonnet Carre Spillway
3) 200,000 cfs diversion at Caernarvon with sediment enrichment
4) 15,000 cfs diversion at American/California Bay
5) 12,000 cfs diversion at Bayou Lamoque
1
2
3
4
5
River diversion
Influence area
Subprovince boundary
Subprovince 1
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-190
Map Date: May 8, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
5 0 5 10 15
Miles
N
USGS
science for a changing world
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 1 Alternative E2
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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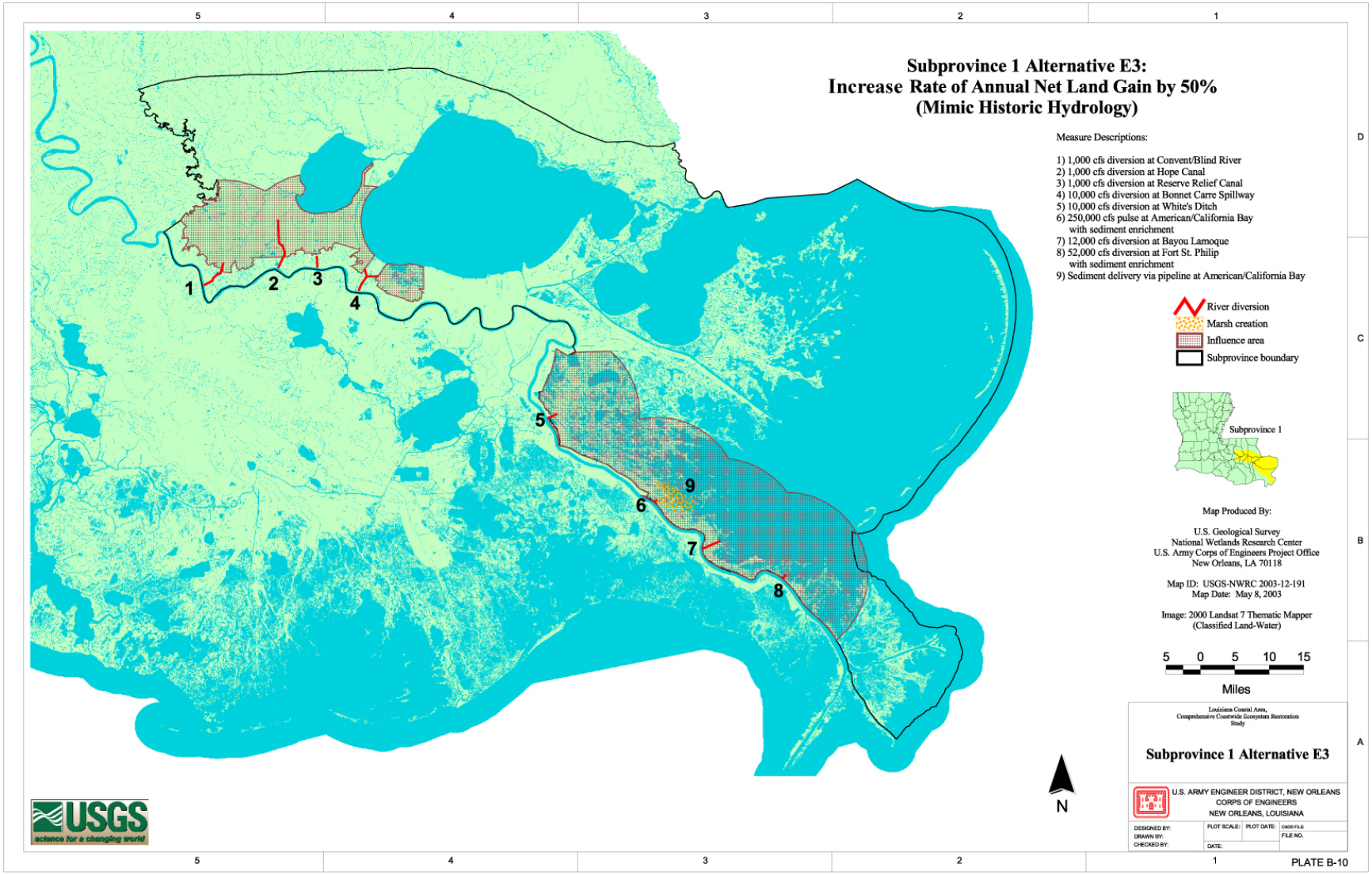
PLOT SCALE:
PLOT DATE:
CADD FILE
FILE NO.
DATE:
PLATE B-9


Subprovince 1 Alternative E3:
Increase Rate of Annual Net Land Gain by 50%
(Mimic Historic Hydrology)
Measure Descriptions:
1) 1,000 cfs diversion at Convent/Blind River
2) 1,000 cfs diversion at Hope Canal
3) 1,000 cfs diversion at Reserve Relief Canal
4) 10,000 cfs diversion at Bonnet Carre Spillway
5) 10,000 cfs diversion at White's Ditch
6) 250,000 cfs pulse at American/California Bay with sediment enrichment
7) 12,000 cfs diversion at Bayou Lamoque
8) 52,000 cfs diversion at Fort St. Philip with sediment enrichment
9) Sediment delivery via pipeline at American/California Bay
River diversion
Marsh creation
Influence area
Subprovince boundary
Subprovince 1
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-191
Map Date: May 8, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classified Land-Water)
5 0 5 10 15
Miles
N
USGS
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Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 1 Alternative E3
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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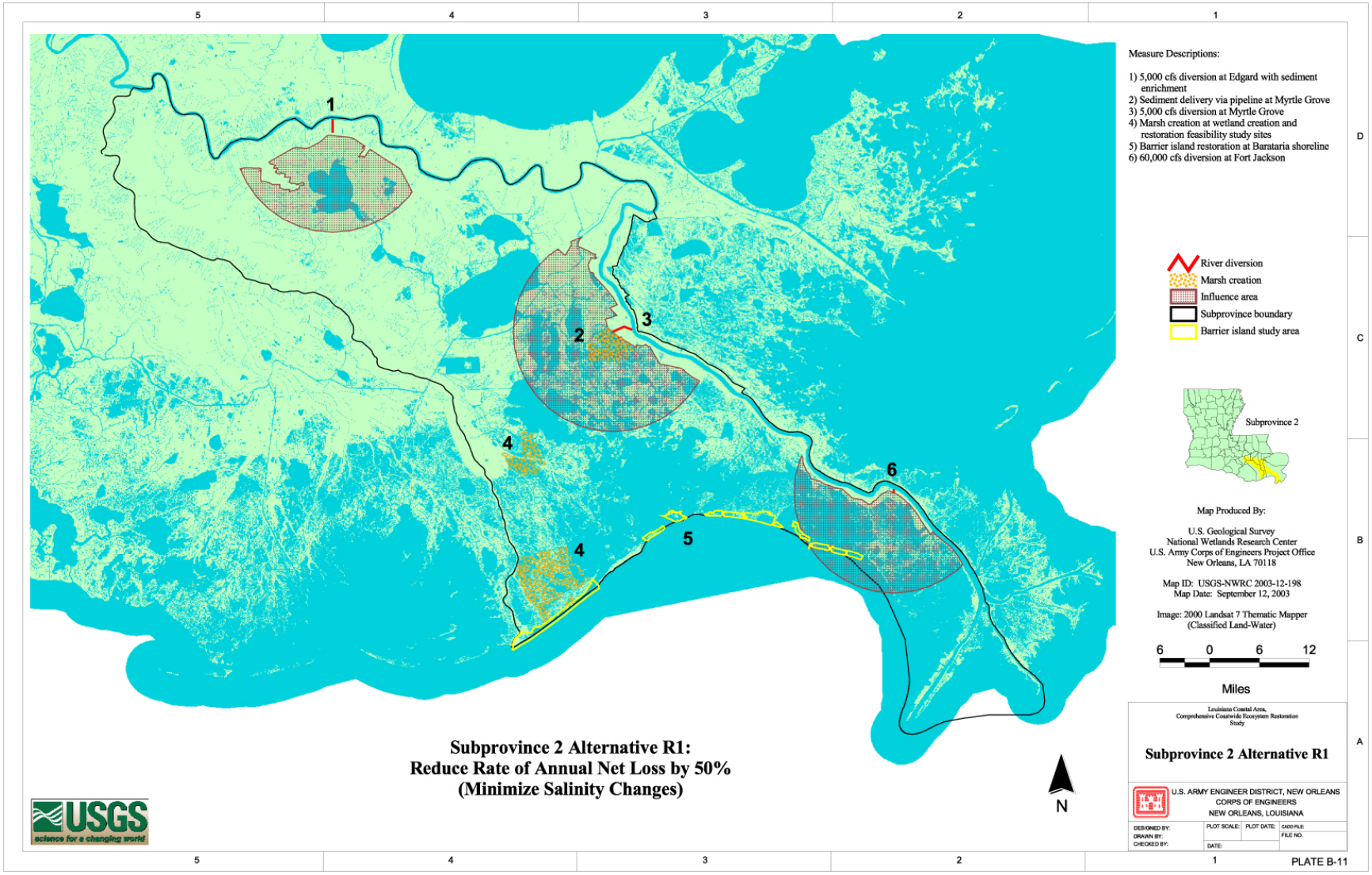
PLOT DATE:
CADD FILE
FILE NO.
DATE:
PLATE B-10


Measure Descriptions:
1) 5,000 cfs diversion at Edgard with sediment enrichment
2) Sediment delivery via pipeline at Myrtle Grove
3) 5,000 cfs diversion at Myrtle Grove
4) Marsh creation at wetland creation and restoration feasibility study sites
5) Barrier island restoration at Barataria shoreline
6) 60,000 cfs diversion at Fort Jackson
River diversion
Marsh creation
Influence area
Subprovince boundary
Barrier island study area
Subprovince 2
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-198
Map Date: September 12, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
6 0 6 12
Miles
Subprovince 2 Alternative R1:
Reduce Rate of Annual Net Loss by 50%
(Minimize Salinity Changes)
N
USGS
science for a changing world
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 2 Alternative R1
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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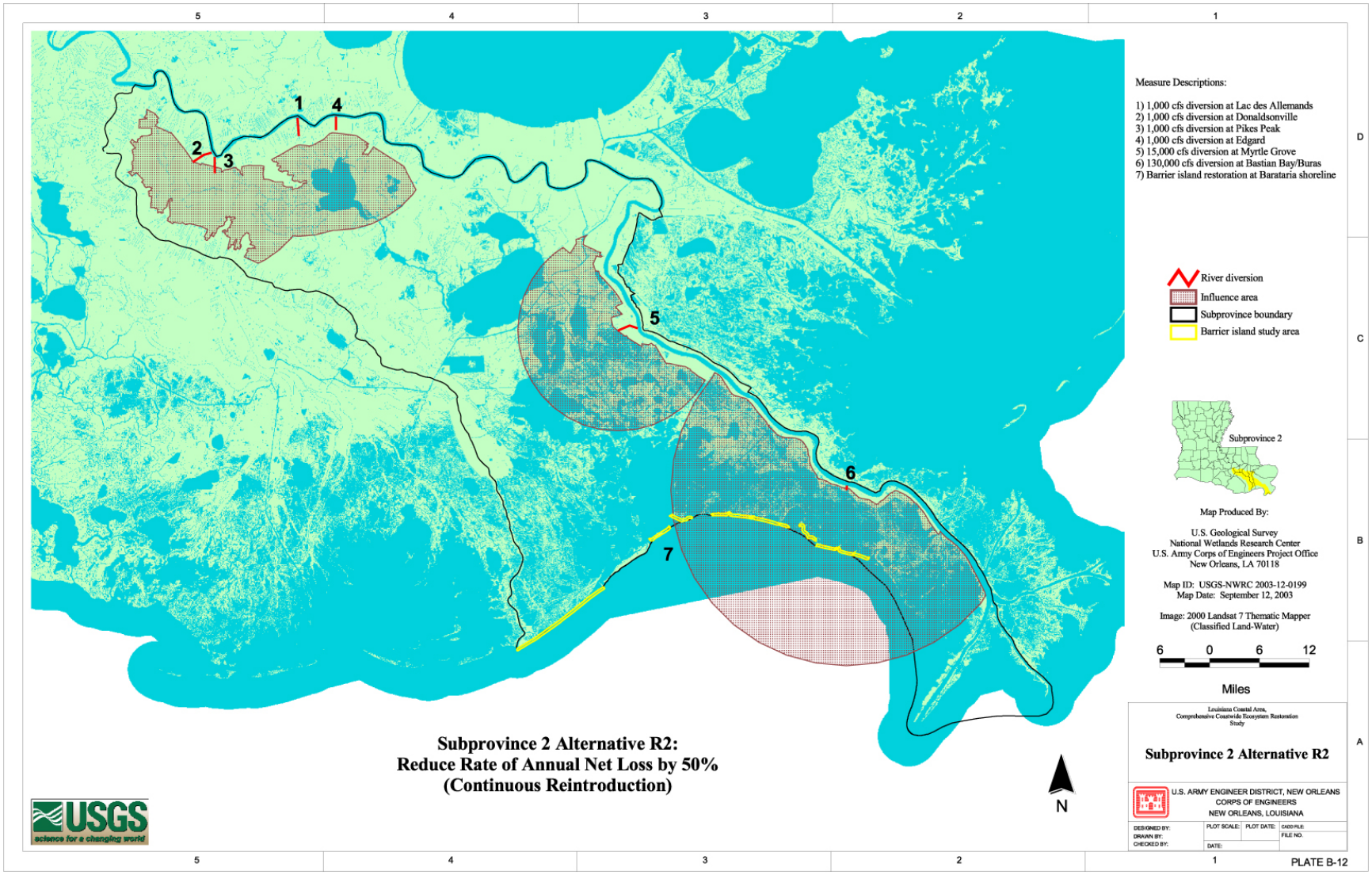
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
PLATE B-11


Measure Descriptions:
1) 1,000 cfs diversion at Lac des Allemands
2) 1,000 cfs diversion at Donaldsonville
3) 1,000 cfs diversion at Pikes Peak
4) 1,000 cfs diversion at Edgard
5) 15,000 cfs diversion at Myrtle Grove
6) 130,000 cfs diversion at Bastian Bay/Buras
7) Barrier island restoration at Barataria shoreline
River diversion
Influence area
Subprovince boundary
Barrier island study area
Subprovince 2
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0199
Map Date: September 12, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
6 0 6 12
Miles
Subprovince 2 Alternative R2:
Reduce Rate of Annual Net Loss by 50%
(Continuous Reintroduction)
N
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 2 Alternative R2
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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FILE NO.
DATE:
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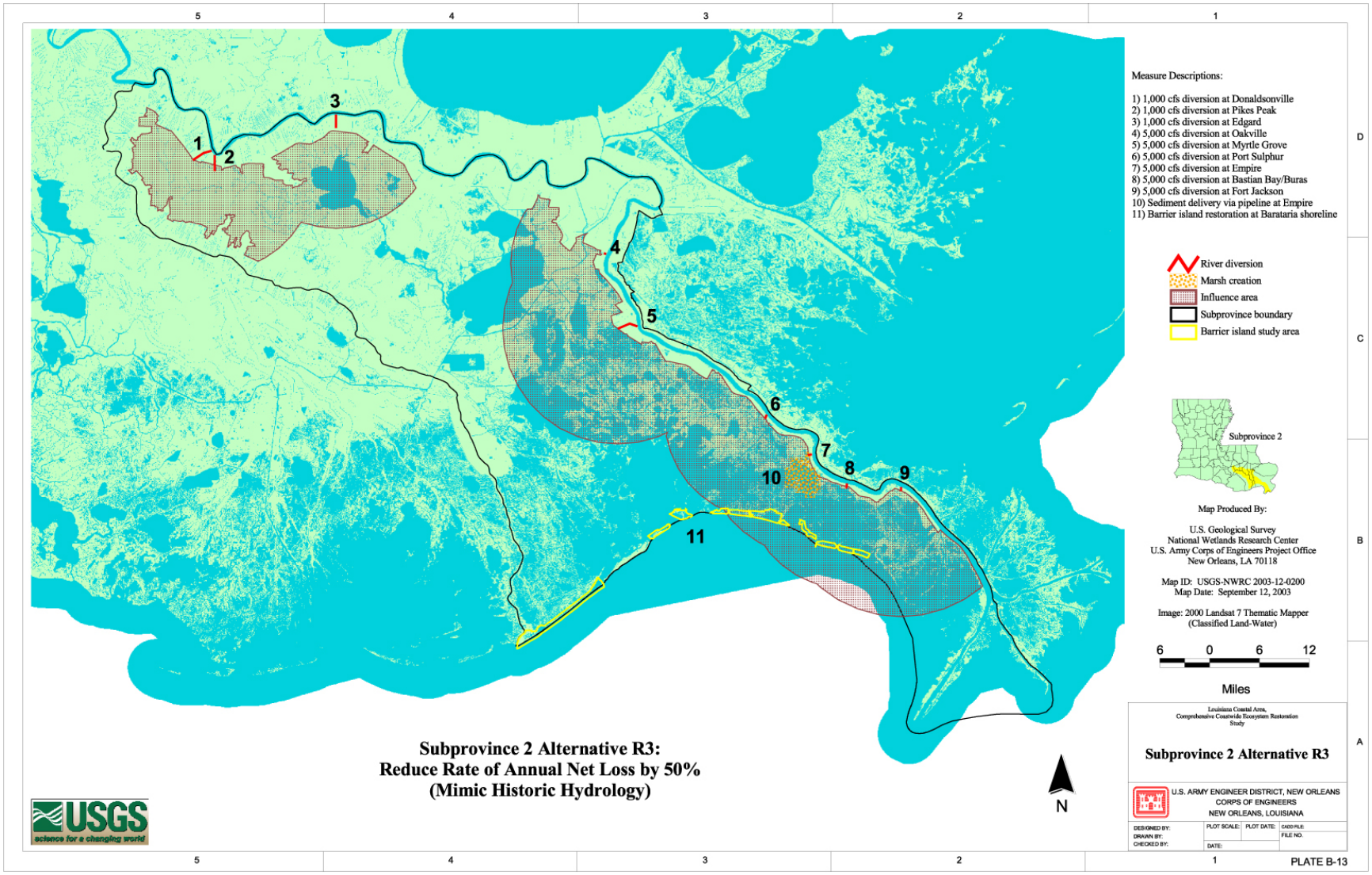
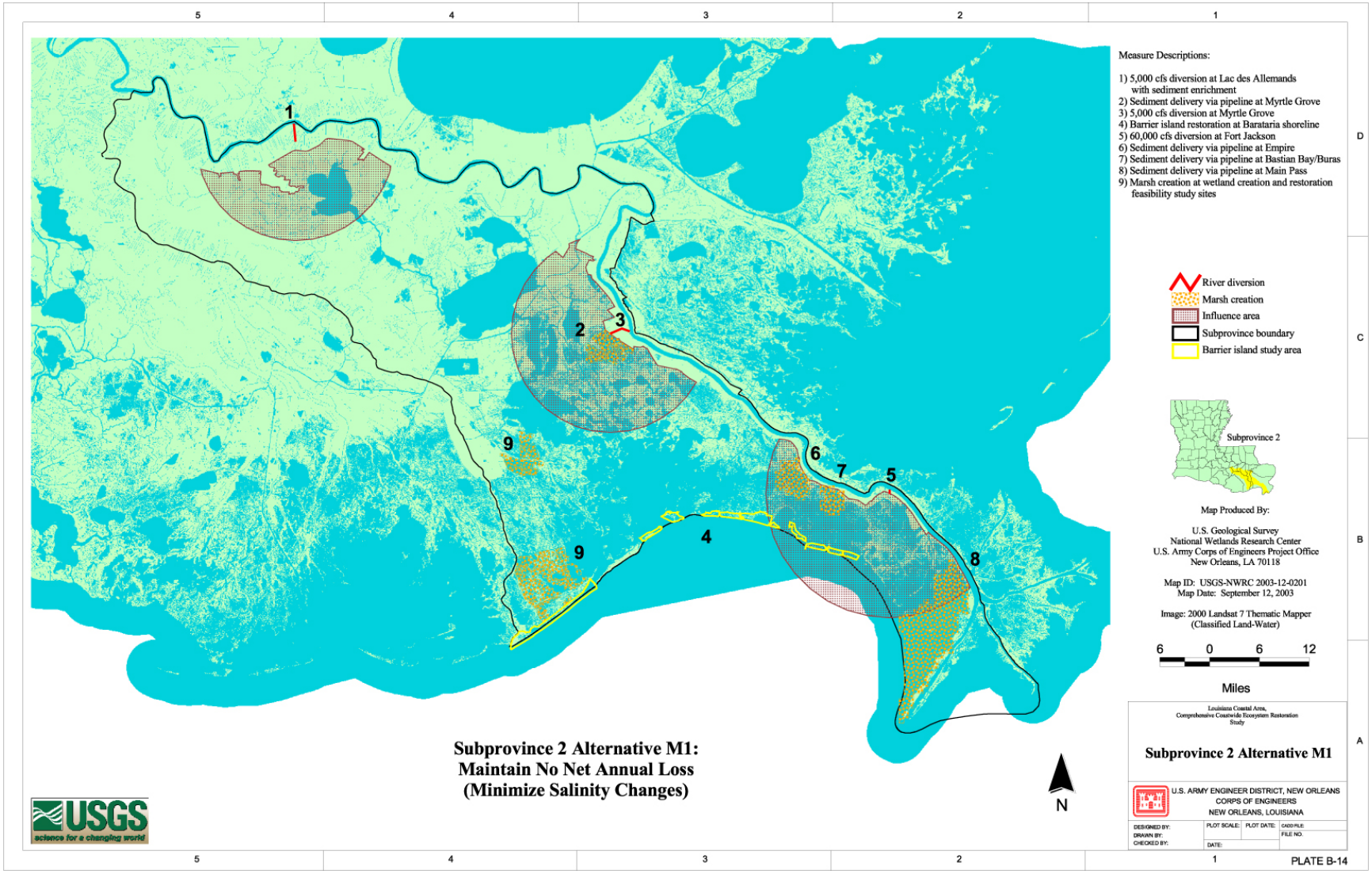
PLATE B-12


Measure Descriptions:
1) 1,000 cfs diversion at Donaldsonville
2) 1,000 cfs diversion at Pikes Peak
3) 1,000 cfs diversion at Edgard
4) 5,000 cfs diversion at Oakville
5) 5,000 cfs diversion at Myrtle Grove
6) 5,000 cfs diversion at Port Sulphur
7) 5,000 cfs diversion at Empire
8) 5,000 cfs diversion at Bastian Bay/Buras
9) 5,000 cfs diversion at Fort Jackson
10) Sediment delivery via pipeline at Empire
11) Barrier island restoration at Barataria shoreline
River diversion
Marsh creation
Influence area
Subprovince boundary
Barrier island study area
Subprovince 2
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0200
Map Date: September 12, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
6 0 6 12
Miles
Subprovince 2 Alternative R3:
Reduce Rate of Annual Net Loss by 50%
(Mimic Historic Hydrology)
N
USGS
science for a changing world
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 2 Alternative R3
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
PLATE B-13


Measure Descriptions:
1) 5,000 cfs diversion at Lac des Allemands with sediment enrichment
2) Sediment delivery via pipeline at Myrtle Grove
3) 5,000 cfs diversion at Myrtle Grove
4) Barrier island restoration at Barataria shoreline
5) 60,000 cfs diversion at Fort Jackson
6) Sediment delivery via pipeline at Empire
7) Sediment delivery via pipeline at Bastian Bay/Buras
8) Sediment delivery via pipeline at Main Pass
9) Marsh creation at wetland creation and restoration feasibility study sites
River diversion
Marsh creation
Influence area
Subprovince boundary
Barrier island study area
Subprovince 2
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0201
Map Date: September 12, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classified Land-Water)
6 0 6 12
Miles
Subprovince 2 Alternative M1: Maintain No Net Annual Loss (Minimize Salinity Changes)
N
Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 2 Alternative M1
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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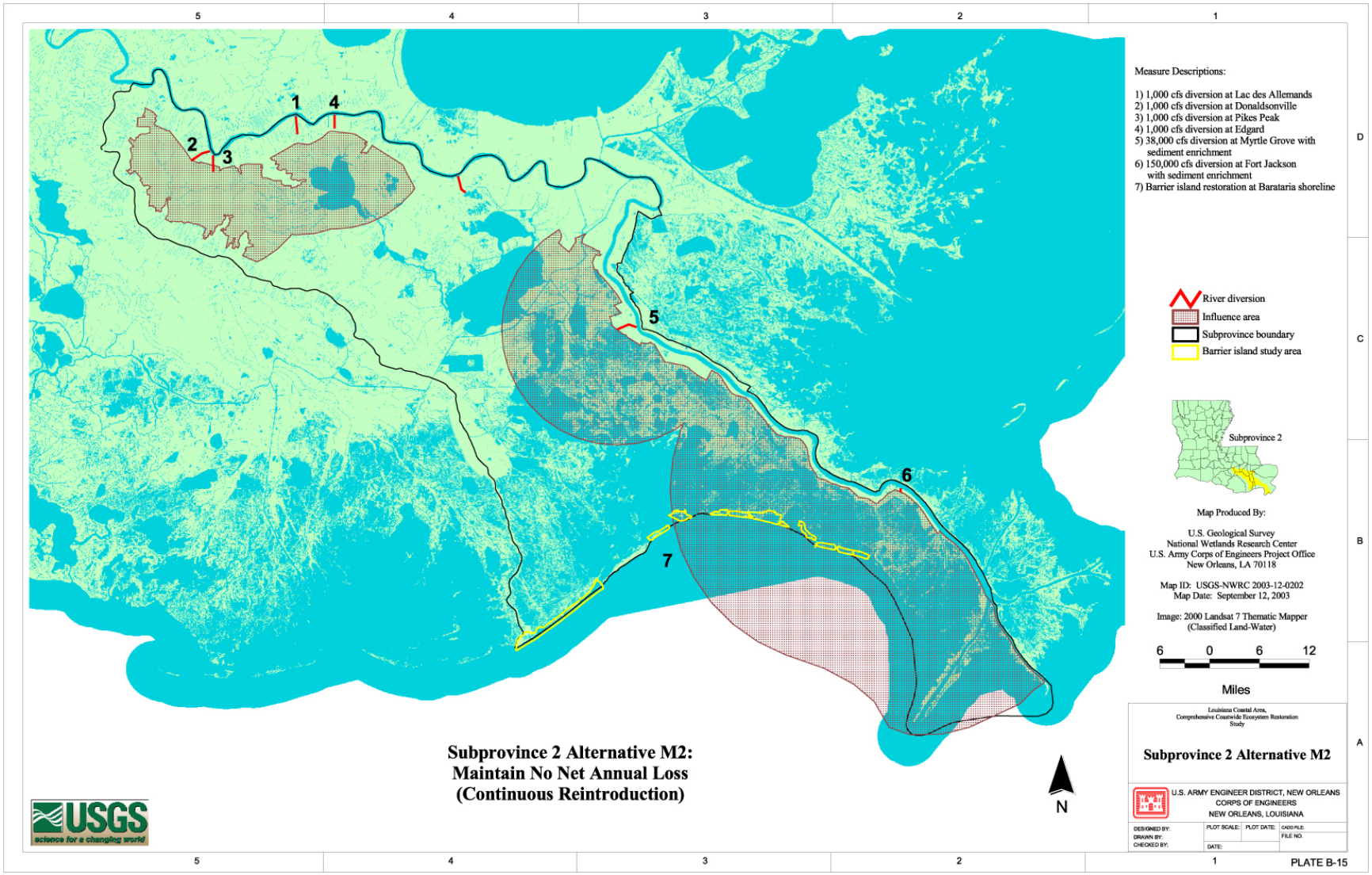
DATE:
USGS
science for a changing world
PLATE B-14


Measure Descriptions:
1) 1,000 cfs diversion at Lac des Allemands
2) 1,000 cfs diversion at Donaldsonville
3) 1,000 cfs diversion at Pikes Peak
4) 1,000 cfs diversion at Edgard
5) 38,000 cfs diversion at Myrtle Grove with sediment enrichment
6) 150,000 cfs diversion at Fort Jackson with sediment enrichment
7) Barrier island restoration at Barataria shoreline
River diversion
Influence area
Subprovince boundary
Barrier island study area
Subprovince 2
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0202
Map Date: September 12, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classified Land-Water)
6 0 6 12
Miles
Subprovince 2 Alternative M2: Maintain No Net Annual Loss (Continuous Reintroduction)
N
USGS
science for a changing world
Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 2 Alternative M2
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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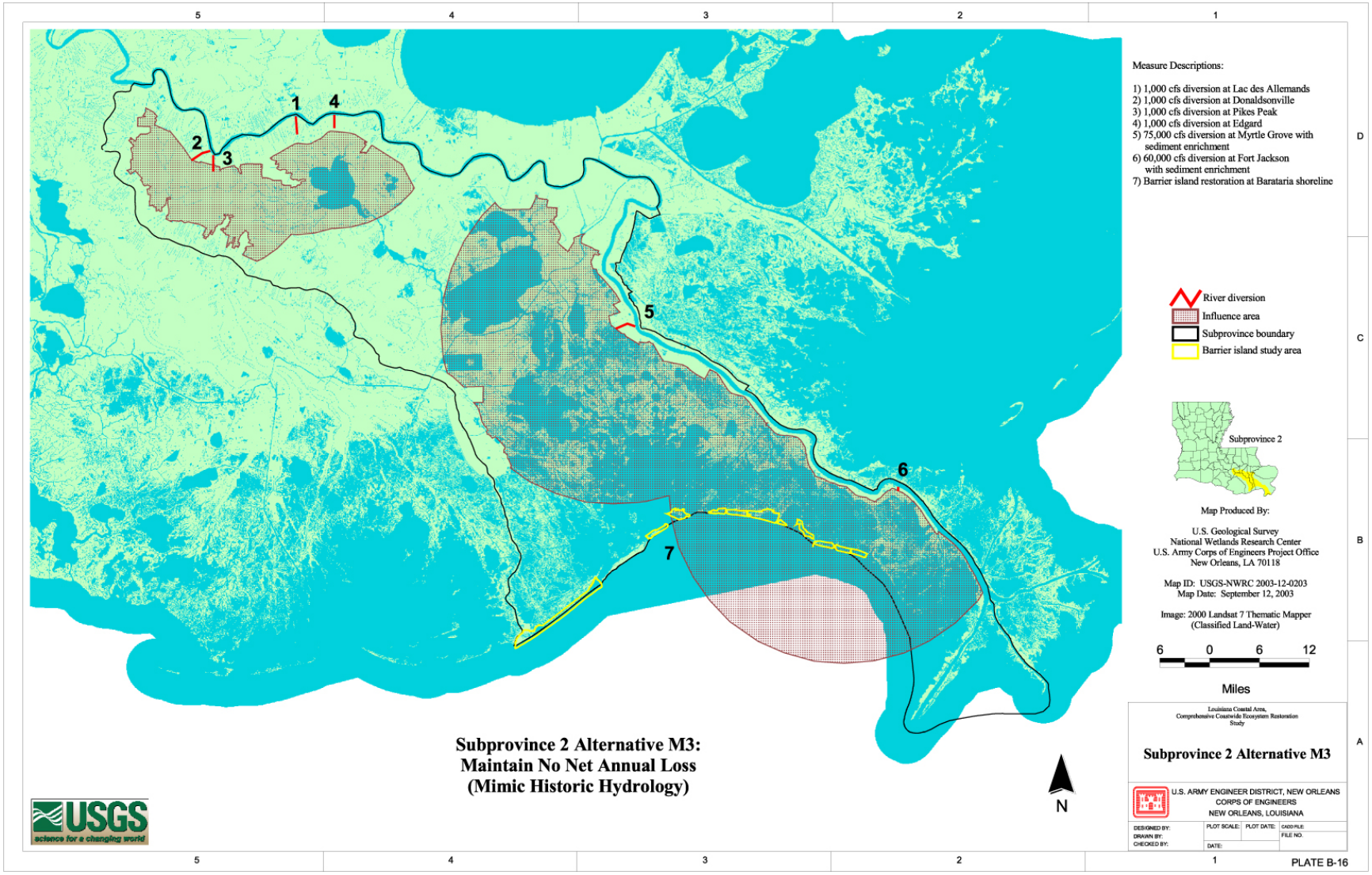
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
PLATE B-15


Measure Descriptions:
1) 1,000 cfs diversion at Lac des Allemands
2) 1,000 cfs diversion at Donaldsonville
3) 1,000 cfs diversion at Pikes Peak
4) 1,000 cfs diversion at Edgard
5) 75,000 cfs diversion at Myrtle Grove with sediment enrichment
6) 60,000 cfs diversion at Fort Jackson with sediment enrichment
7) Barrier island restoration at Barataria shoreline
River diversion
Influence area
Subprovince boundary
Barrier island study area
Subprovince 2
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0203
Map Date: September 12, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classified Land-Water)
6 0 6 12
Miles
Subprovince 2 Alternative M3:
Maintain No Net Annual Loss
(Mimic Historic Hydrology)
N
USGS
science for a changing world
Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 2 Alternative M3
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY:
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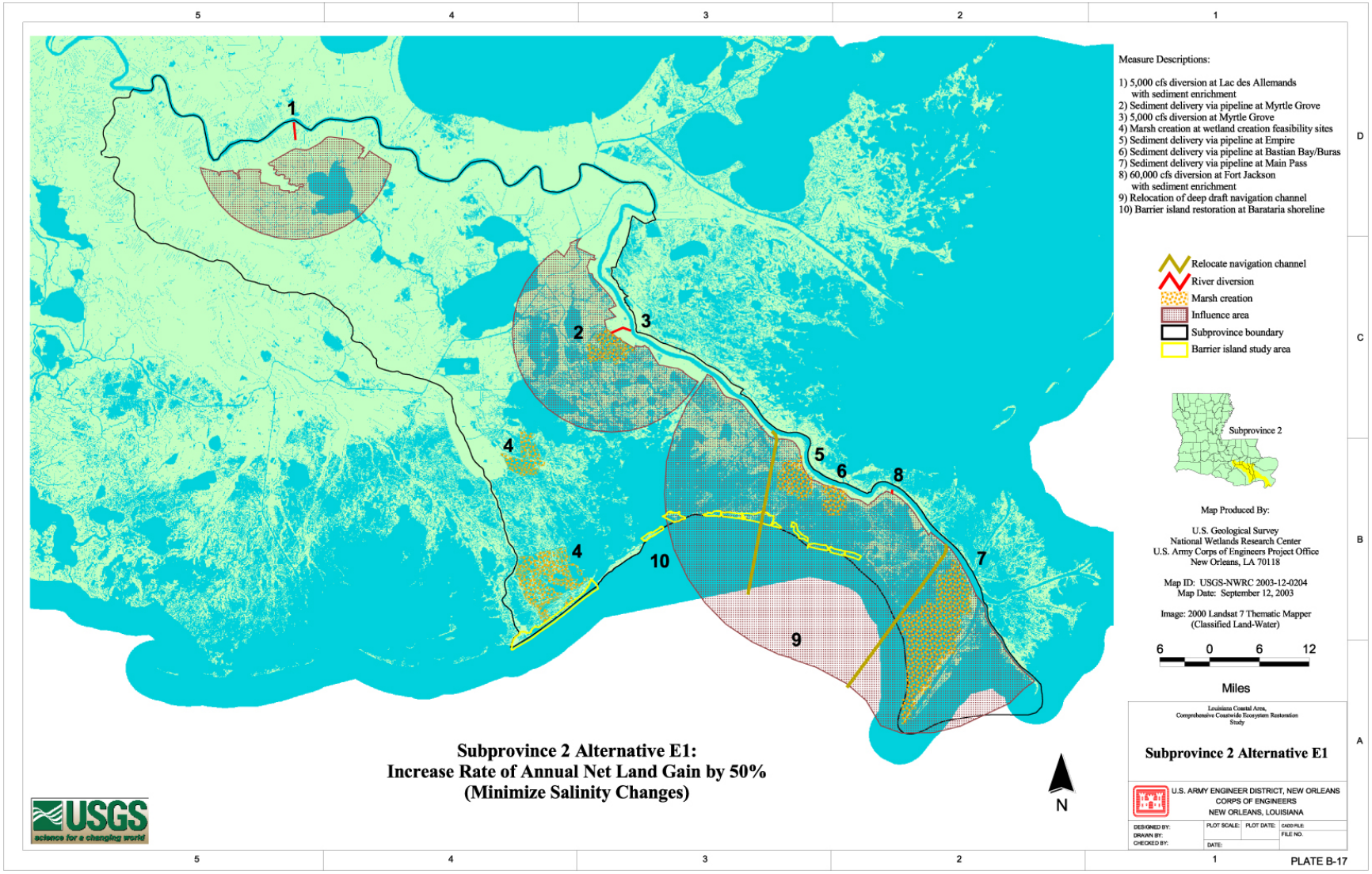
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
PLATE B-16


Measure Descriptions:
1) 5,000 cfs diversion at Lac des Allemands with sediment enrichment
2) Sediment delivery via pipeline at Myrtle Grove
3) 5,000 cfs diversion at Myrtle Grove
4) Marsh creation at wetland creation feasibility sites
5) Sediment delivery via pipeline at Empire
6) Sediment delivery via pipeline at Bastian Bay/Buras
7) Sediment delivery via pipeline at Main Pass
8) 60,000 cfs diversion at Fort Jackson with sediment enrichment
9) Relocation of deep draft navigation channel
10) Barrier island restoration at Barataria shoreline
Relocate navigation channel
River diversion
Marsh creation
Influence area
Subprovince boundary
Barrier island study area
Subprovince 2
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0204
Map Date: September 12, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classified Land-Water)
6 0 6 12
Miles
Subprovince 2 Alternative E1:
Increase Rate of Annual Net Land Gain by 50%
(Minimize Salinity Changes)
N
USGS
science for a changing world
Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 2 Alternative E1
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY:
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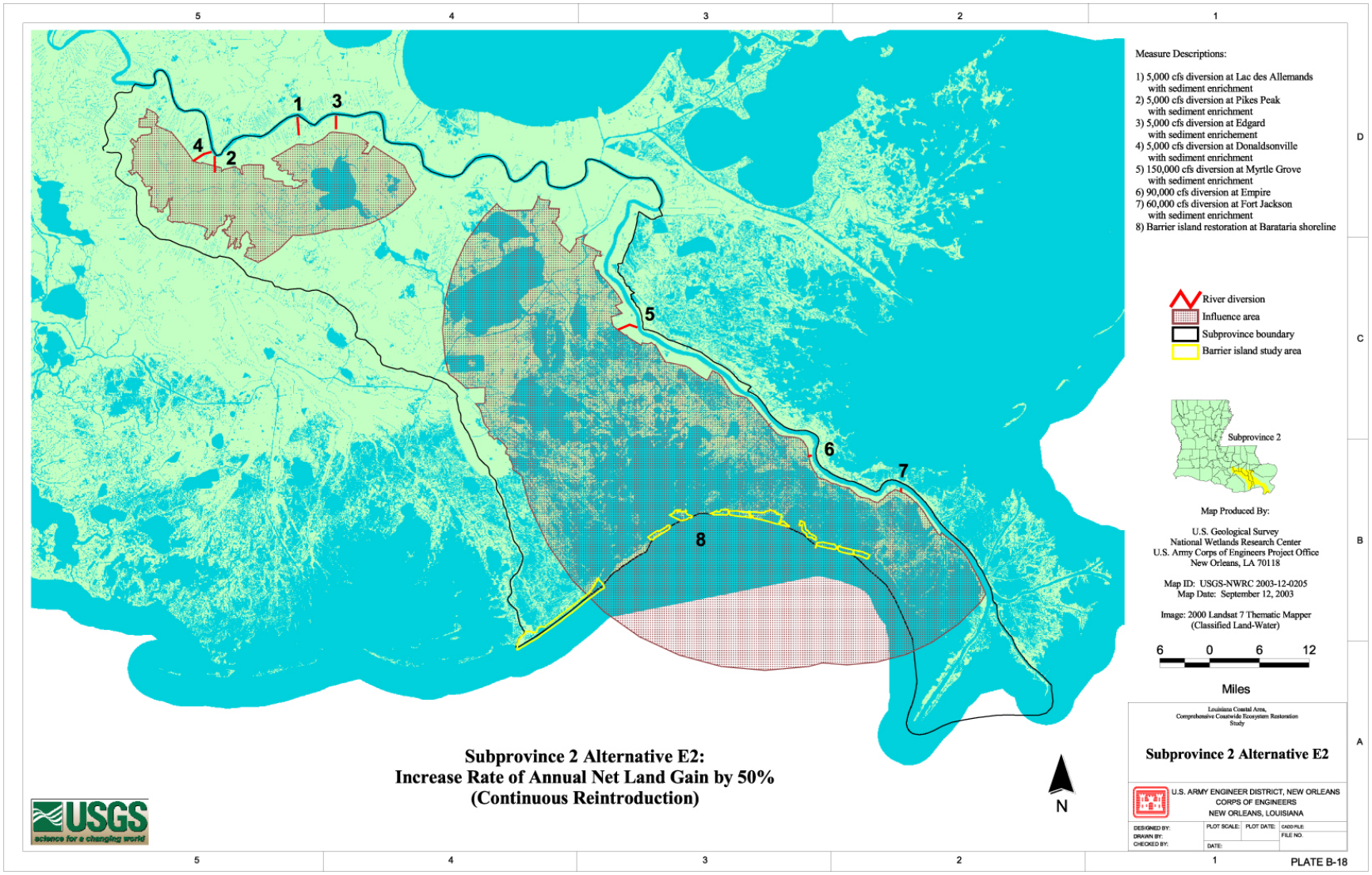
CHECKED BY:
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
PLATE B-17


Measure Descriptions:
1) 5,000 cfs diversion at Lac des Allemands with sediment enrichment
2) 5,000 cfs diversion at Pikes Peak with sediment enrichment
3) 5,000 cfs diversion at Edgard with sediment enrichement
4) 5,000 cfs diversion at Donaldsonville with sediment enrichment
5) 150,000 cfs diversion at Myrtle Grove with sediment enrichment
6) 90,000 cfs diversion at Empire
7) 60,000 cfs diversion at Fort Jackson with sediment enrichment
8) Barrier island restoration at Barataria shoreline
River diversion
Influence area
Subprovince boundary
Barrier island study area
Subprovince 2
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0205
Map Date: September 12, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classified Land-Water)
6 0 6 12
Miles
Subprovince 2 Alternative E2:
Increase Rate of Annual Net Land Gain by 50%
(Continuous Reintroduction)
N
USGS
science for a changing world
Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 2 Alternative E2
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY:
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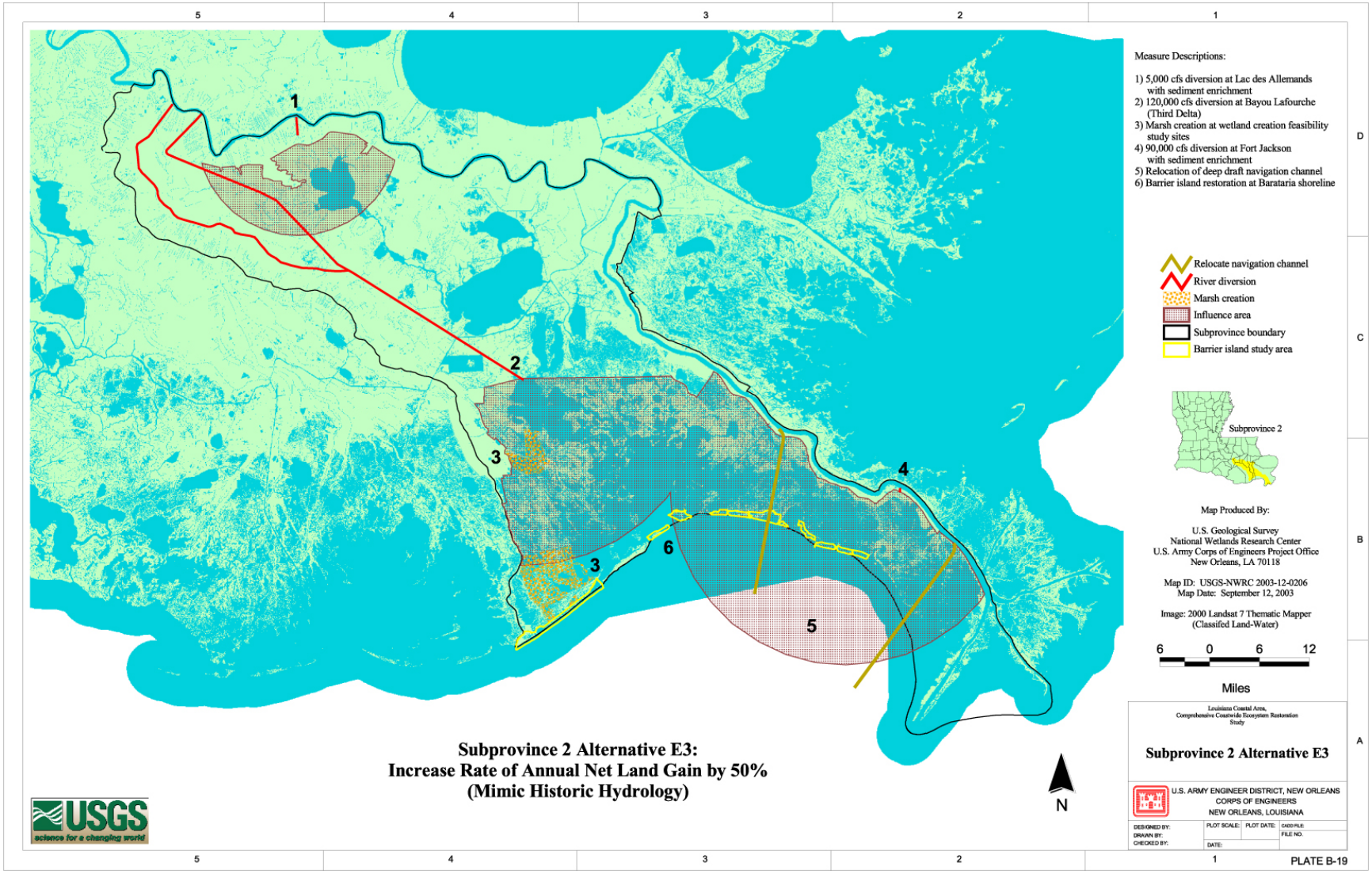
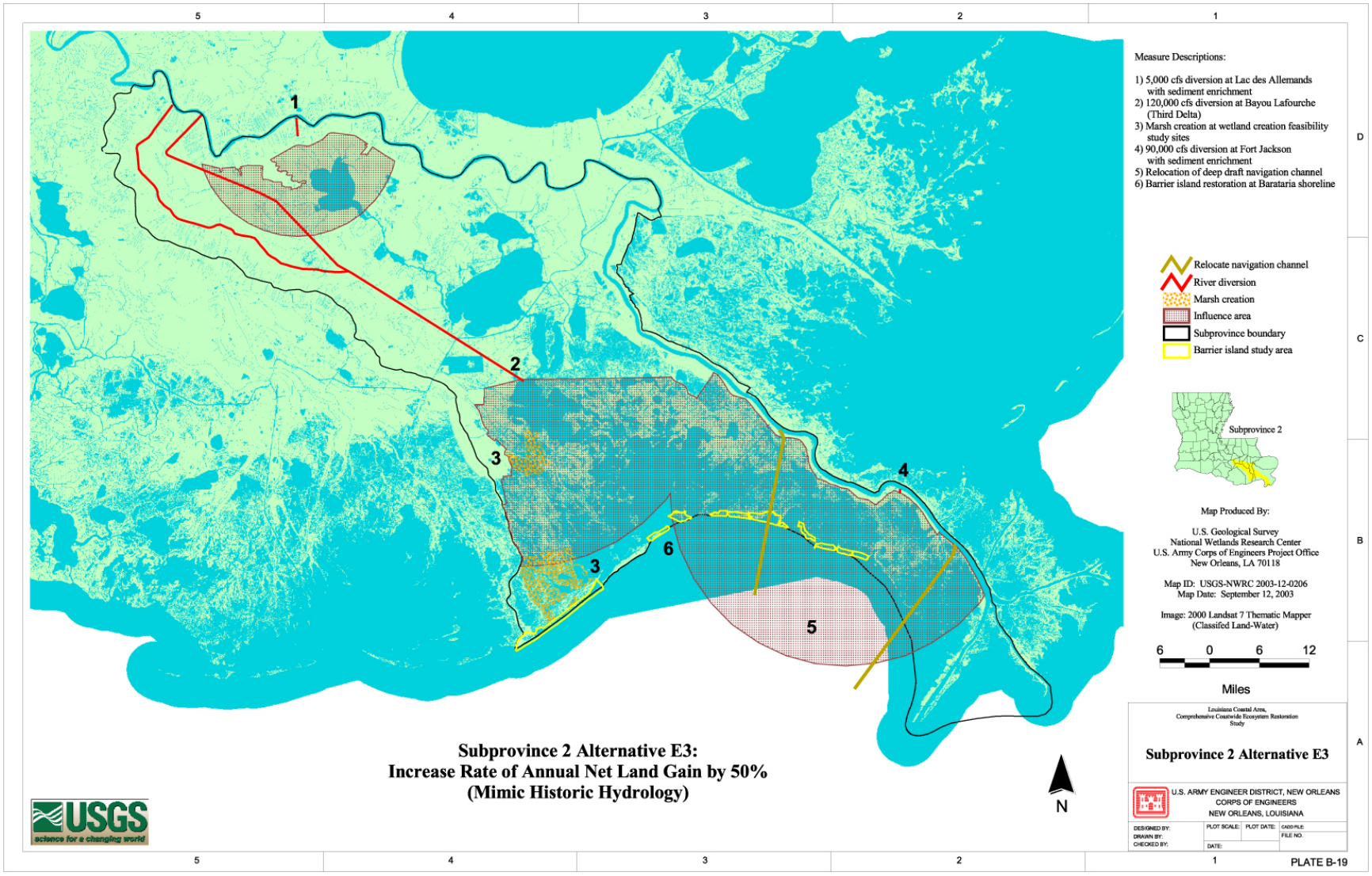
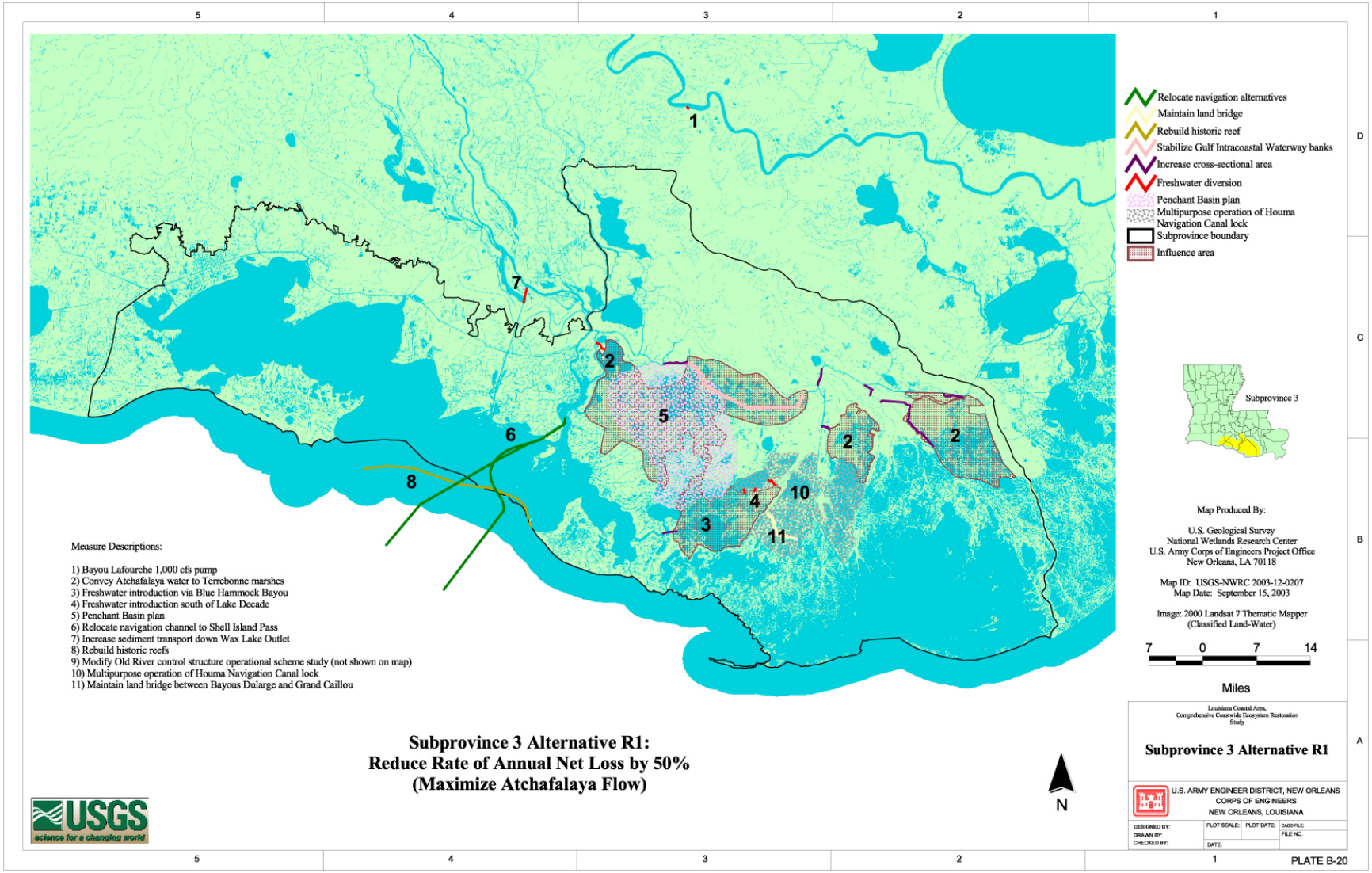
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
PLATE B-18


Measure Descriptions:
1) 5,000 cfs diversion at Lac des Allemands with sediment enrichment
2) 120,000 cfs diversion at Bayou Lafourche (Third Delta)
3) Marsh creation at wetland creation feasibility study sites
4) 90,000 cfs diversion at Fort Jackson with sediment enrichment
5) Relocation of deep draft navigation channel
6) Barrier island restoration at Barataria shoreline
Relocate navigation channel
River diversion
Marsh creation
Influence area
Subprovince boundary
Barrier island study area
Subprovince 2
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0206
Map Date: September 12, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classifed Land-Water)
6 0 6 12
Miles
Subprovince 2 Alternative E3:
Increase Rate of Annual Net Land Gain by 50%
(Mimic Historic Hydrology)
N
USGS
science for a changing world
Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 2 Alternative E3
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY:
DRAWN BY:
CHECKED BY:
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
PLATE B-19


Measure Descriptions:
1) 5,000 cfs diversion at Lac des Allemands with sediment enrichment
2) 120,000 cfs diversion at Bayou Lafourche (Third Delta)
3) Marsh creation at wetland creation feasibility study sites
4) 90,000 cfs diversion at Fort Jackson with sediment enrichment
5) Relocation of deep draft navigation channel
6) Barrier island restoration at Barataria shoreline
Relocate navigation channel
River diversion
Marsh creation
Influence area
Subprovince boundary
Barrier island study area
Subprovince 2
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0206
Map Date: September 12, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classifed Land-Water)
6 0 6 12
Miles
Subprovince 2 Alternative E3:
Increase Rate of Annual Net Land Gain by 50%
(Mimic Historic Hydrology)
N
USGS
science for a changing world
Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 2 Alternative E3
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY:
DRAWN BY:
CHECKED BY:
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
PLATE B-19


Relocate navigation alternatives
Maintain land bridge
Rebuild historic reef
Stabilize Gulf Intracoastal Waterway banks
Increase cross-sectional area
Freshwater diversion
Penchant Basin plan
Multipurpose operation of Houma Navigation Canal lock
Subprovince boundary
Influence area
Subprovince 3
Measure Descriptions:
1) Bayou Lafourche 1,000 cfs pump
2) Convey Atchafalaya water to Terrebonne marshes
3) Freshwater introduction via Blue Hammock Bayou
4) Freshwater introduction south of Lake Decade
5) Penchant Basin plan
6) Relocate navigation channel to Shell Island Pass
7) Increase sediment transport down Wax Lake Outlet
8) Rebuild historic reefs
9) Modify Old River control structure operational scheme study (not shown on map)
10) Multipurpose operation of Houma Navigation Canal lock
11) Maintain land bridge between Bayous Dularge and Grand Caillou
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0207
Map Date: September 15, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
7 0 7 14
Miles
Subprovince 3 Alternative R1:
Reduce Rate of Annual Net Loss by 50%
(Maximize Atchafalaya Flow)
N
USGS
science for a changing world
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 3 Alternative R1
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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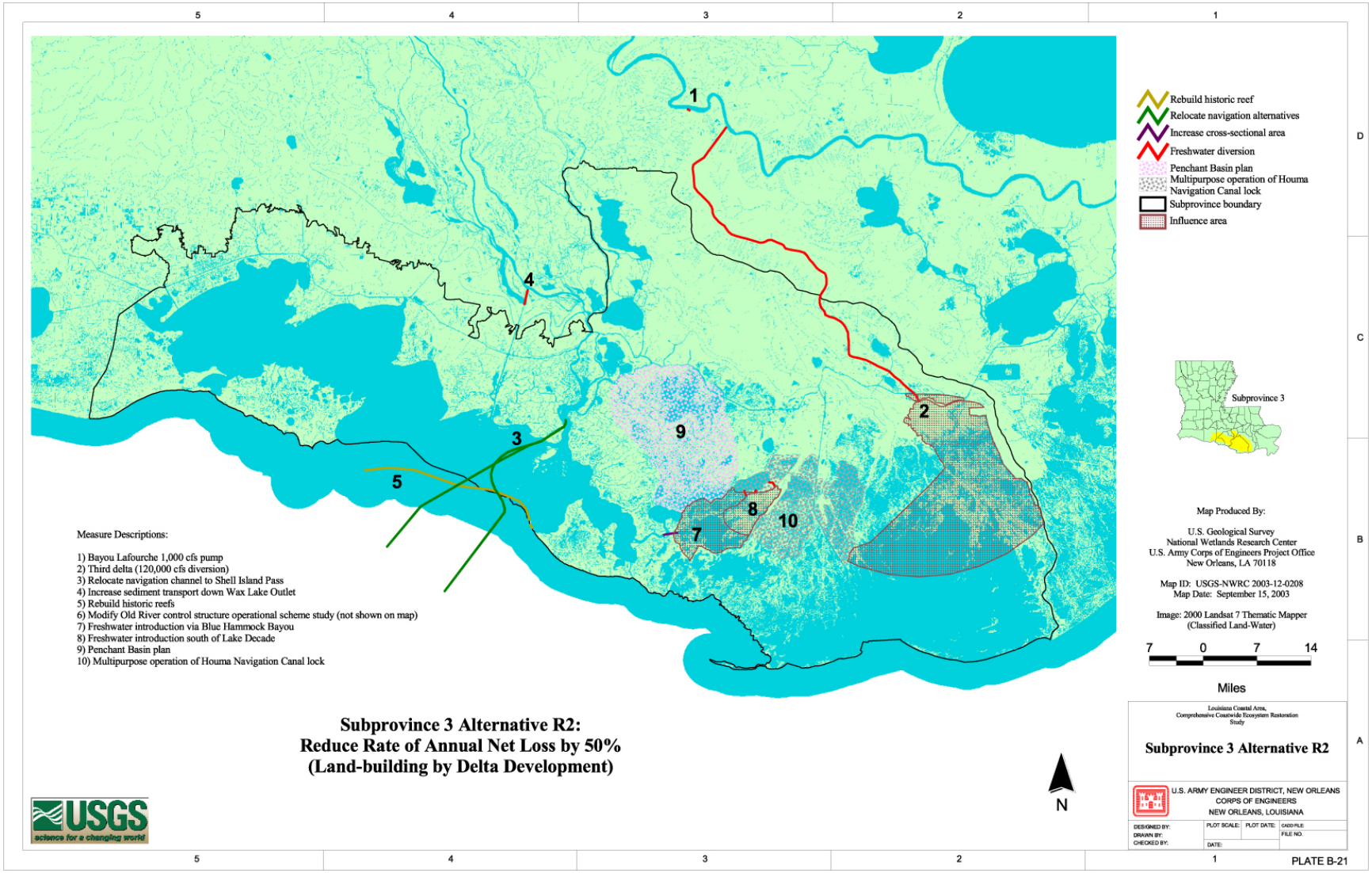
FILE NO.
DATE:
PLATE B-20


Rebuild historic reef
Relocate navigation alternatives
Increase cross-sectional area
Freshwater diversion
Penchant Basin plan
Multipurpose operation of Houma Navigation Canal lock
Subprovince boundary
Influence area
Subprovince 3
Measure Descriptions:
1) Bayou Lafourche 1,000 cfs pump
2) Third delta (120,000 cfs diversion)
3) Relocate navigation channel to Shell Island Pass
4) Increase sediment transport down Wax Lake Outlet
5) Rebuild historic reefs
6) Modify Old River control structure operational scheme study (not shown on map)
7) Freshwater introduction via Blue Hammock Bayou
8) Freshwater introduction south of Lake Decade
9) Penchant Basin plan
10) Multipurpose operation of Houma Navigation Canal lock
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0208
Map Date: September 15, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
7 0 7 14
Miles
Subprovince 3 Alternative R2:
Reduce Rate of Annual Net Loss by 50%
(Land-building by Delta Development)
N
USGS
science for a changing world
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 3 Alternative R2
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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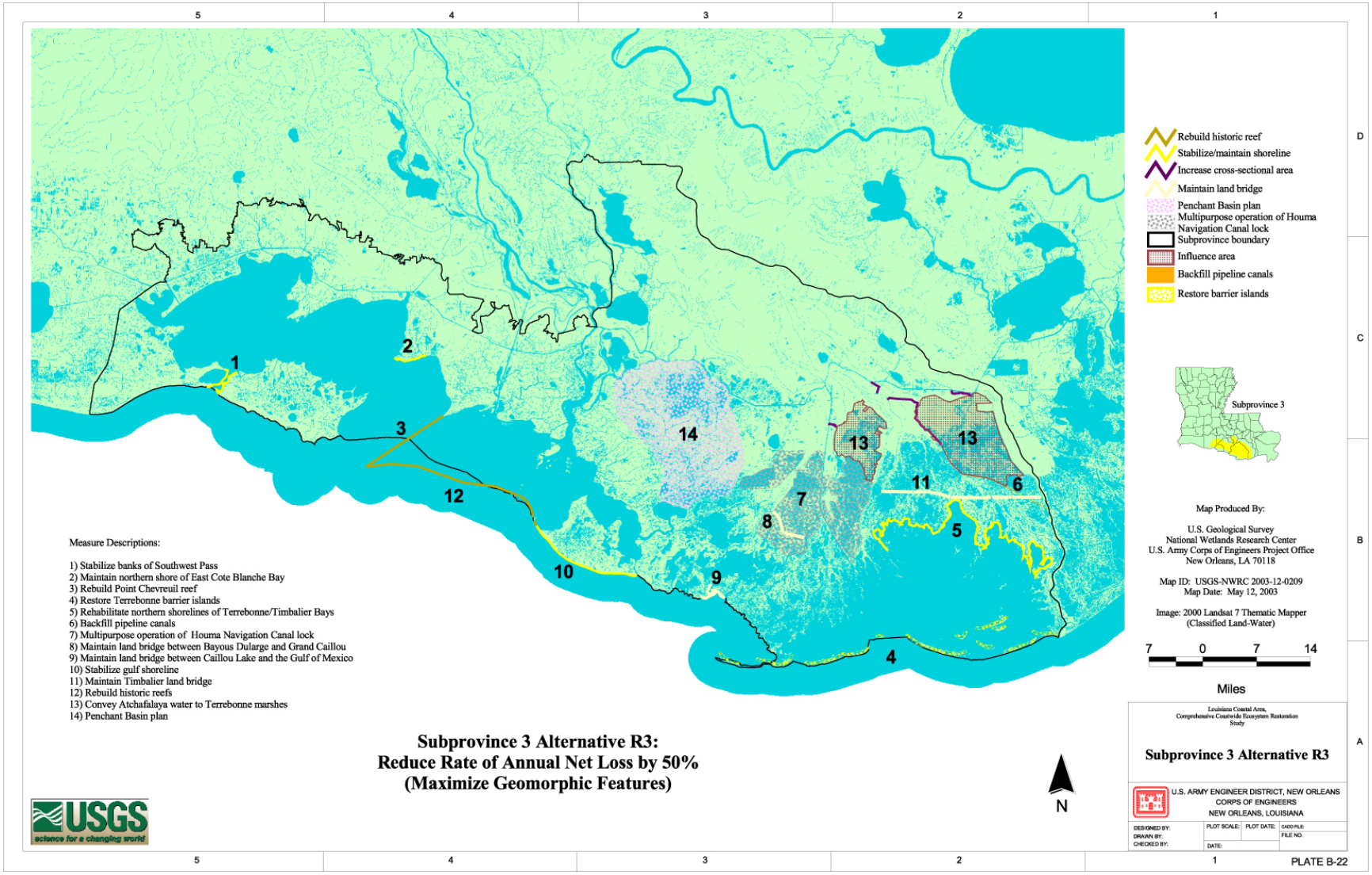
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
PLATE B-21


Rebuild historic reef
Stabilize/maintain shoreline
Increase cross-sectional area
Maintain land bridge
Penchant Basin plan
Multipurpose operation of Houma Navigation Canal lock
Subprovince boundary
Influence area
Backfill pipeline canals
Restore barrier islands
Subprovince 3
Measure Descriptions:
1) Stabilize banks of Southwest Pass
2) Maintain northern shore of East Cote Blanche Bay
3) Rebuild Point Chevreuil reef
4) Restore Terrebonne barrier islands
5) Rehabilitate northern shorelines of Terrebonne/Timbalier Bays
6) Backfill pipeline canals
7) Multipurpose operation of Houma Navigation Canal lock
8) Maintain land bridge between Bayous Dularge and Grand Caillou
9) Maintain land bridge between Caillou Lake and the Gulf of Mexico
10) Stabilize gulf shoreline
11) Maintain Timbalier land bridge
12) Rebuild historic reefs
13) Convey Atchafalaya water to Terrebonne marshes
14) Penchant Basin plan
Subprovince 3 Alternative R3:
Reduce Rate of Annual Net Loss by 50%
(Maximize Geomorphic Features)
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0209
Map Date: May 12, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
7 0 7 14
Miles
N
USGS
science for a changing world
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 3 Alternative R3
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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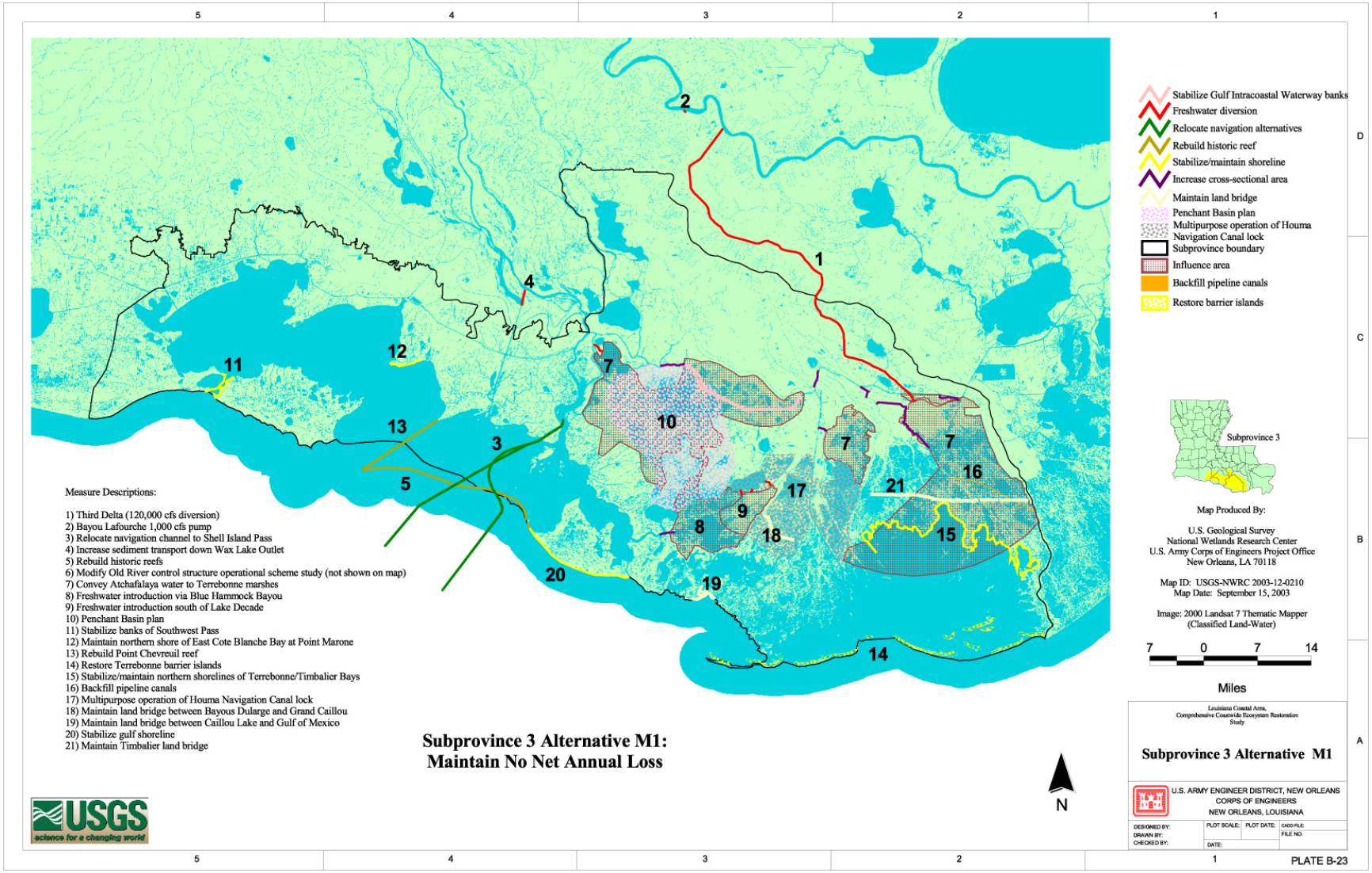
NEW ORLEANS, LOUISIANA
PLATE B-22


Stabilize Gulf Intracoastal Waterway banks
Freshwater diversion
Relocate navigation alternatives
Rebuild historic reef
Stabilize/maintain shoreline
Increase cross-sectional area
Maintain land bridge
Penchant Basin plan
Multipurpose operation of Houma Navigation Canal lock
Subprovince boundary
Influence area
Backfill pipeline canals
Restore barrier islands
Subprovince 3
Measure Descriptions:
1) Third Delta (120,000 cfs diversion)
2) Bayou Lafourche 1,000 cfs pump
3) Relocate navigation channel to Shell Island Pass
4) Increase sediment transport down Wax Lake Outlet
5) Rebuild historic reefs
6) Modify Old River control structure operational scheme study (not shown on map)
7) Convey Atchafalaya water to Terrebonne marshes
8) Freshwater introduction via Blue Hammock Bayou
9) Freshwater introduction south of Lake Decade
10) Penchant Basin plan
11) Stabilize banks of Southwest Pass
12) Maintain northern shore of East Cote Blanche Bay at Point Marone
13) Rebuild Point Chevreuil reef
14) Restore Terrebonne barrier islands
15) Stabilize/maintain northern shorelines of Terrebonne/Timbalier Bays
16) Backfill pipeline canals
17) Multipurpose operation of Houma Navigation Canal lock
18) Maintain land bridge between Bayous Dularge and Grand Caillou
19) Maintain land bridge between Caillou Lake and Gulf of Mexico
20) Stabilize gulf shoreline
21) Maintain Timbalier land bridge
Subprovince 3 Alternative M1:
Maintain No Net Annual Loss
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0210
Map Date: September 15, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
7 0 7 14
Miles
N
USGS
science for a changing world
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 3 Alternative M1
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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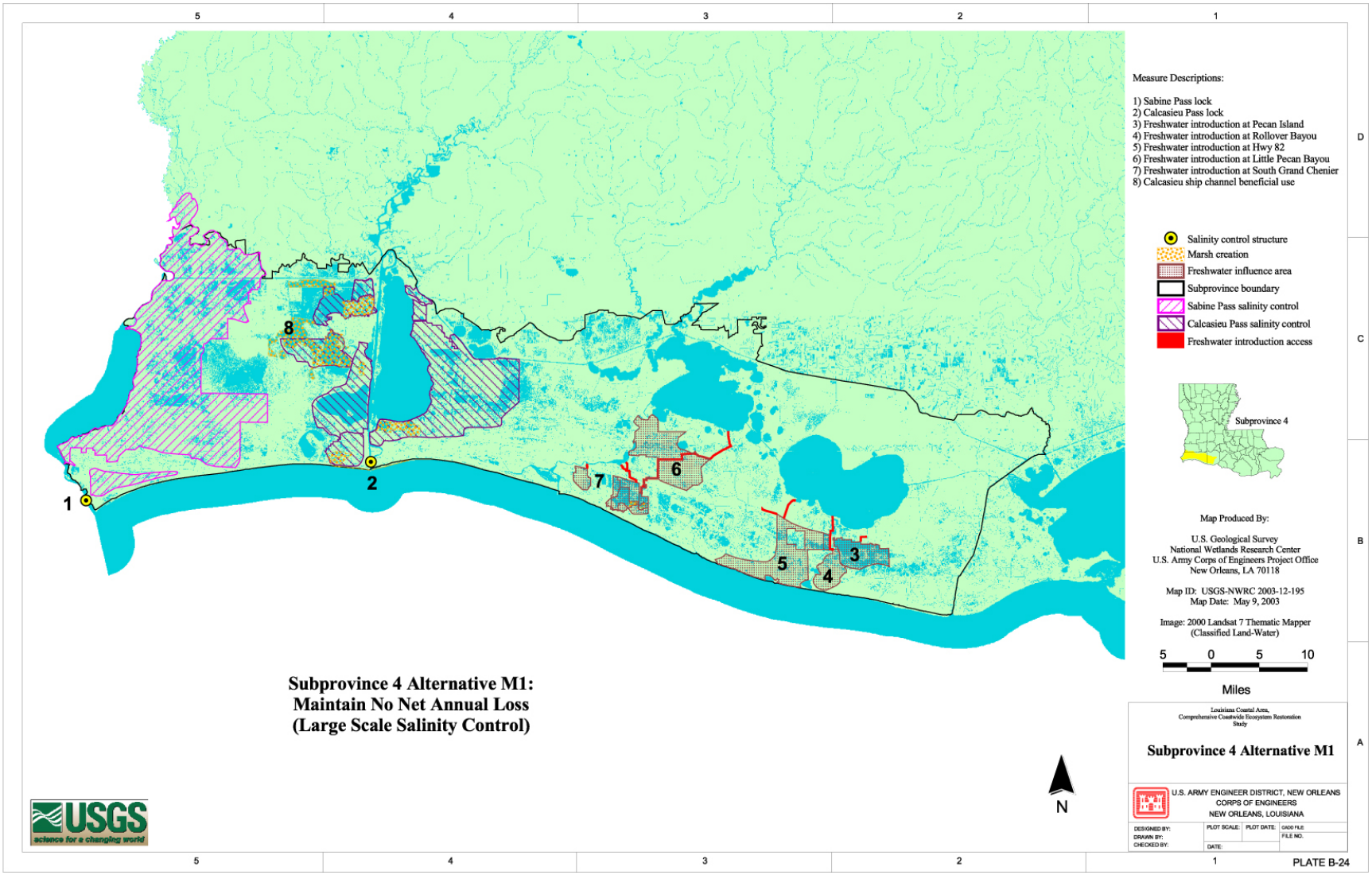
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
PLATE B-23


Measure Descriptions:
1) Sabine Pass lock
2) Calcasieu Pass lock
3) Freshwater introduction at Pecan Island
4) Freshwater introduction at Rollover Bayou
5) Freshwater introduction at Hwy 82
6) Freshwater introduction at Little Pecan Bayou
7) Freshwater introduction at South Grand Chenier
8) Calcasieu ship channel beneficial use
Salinity control structure
Marsh creation
Freshwater influence area
Subprovince boundary
Sabine Pass salinity control
Calcasieu Pass salinity control
Freshwater introduction access
Subprovince 4
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-195
Map Date: May 9, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
5 0 5 10
Miles
Subprovince 4 Alternative M1:
Maintain No Net Annual Loss
(Large Scale Salinity Control)
N
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 4 Alternative M1
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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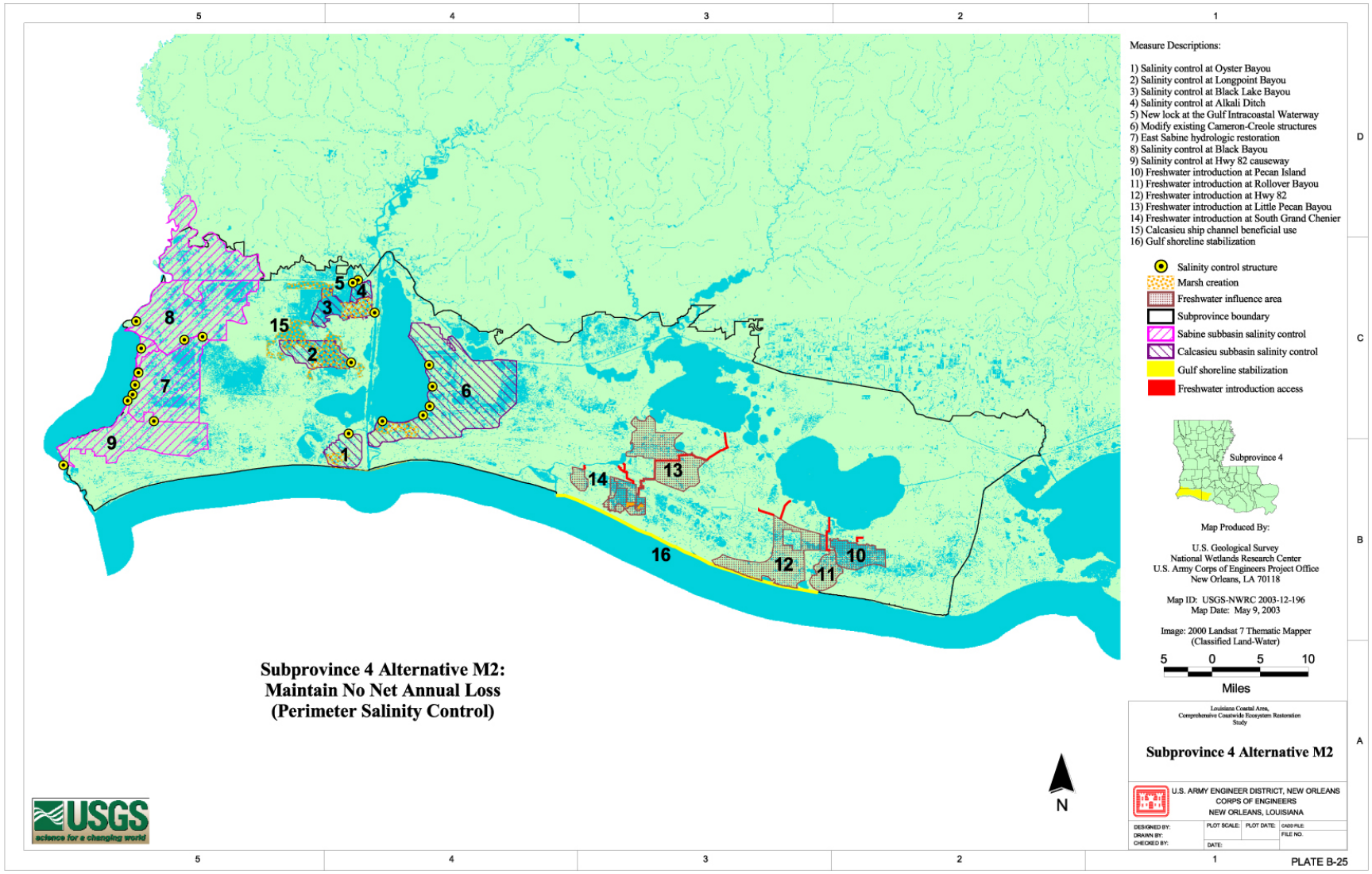
DRAWN BY:
CHECKED BY:
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
USGS
science for a changing world
PLATE B-24


Measure Descriptions:
1) Salinity control at Oyster Bayou
2) Salinity control at Longpoint Bayou
3) Salinity control at Black Lake Bayou
4) Salinity control at Alkali Ditch
5) New lock at the Gulf Intracoastal Waterway
6) Modify existing Cameron-Creole structures
7) East Sabine hydrologic restoration
8) Salinity control at Black Bayou
9) Salinity control at Hwy 82 causeway
10) Freshwater introduction at Pecan Island
11) Freshwater introduction at Rollover Bayou
12) Freshwater introduction at Hwy 82
13) Freshwater introduction at Little Pecan Bayou
14) Freshwater introduction at South Grand Chenier
15) Calcasieu ship channel beneficial use
16) Gulf shoreline stabilization
Salinity control structure
Marsh creation
Freshwater influence area
Subprovince boundary
Sabine subbasin salinity control
Calcasieu subbasin salinity control
Gulf shoreline stabilization
Freshwater introduction access
Subprovince 4
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-196
Map Date: May 9, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
5 0 5 10
Miles
Subprovince 4 Alternative M2:
Maintain No Net Annual Loss
(Perimeter Salinity Control)
N
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 4 Alternative M2
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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DATE:
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PLATE B-25

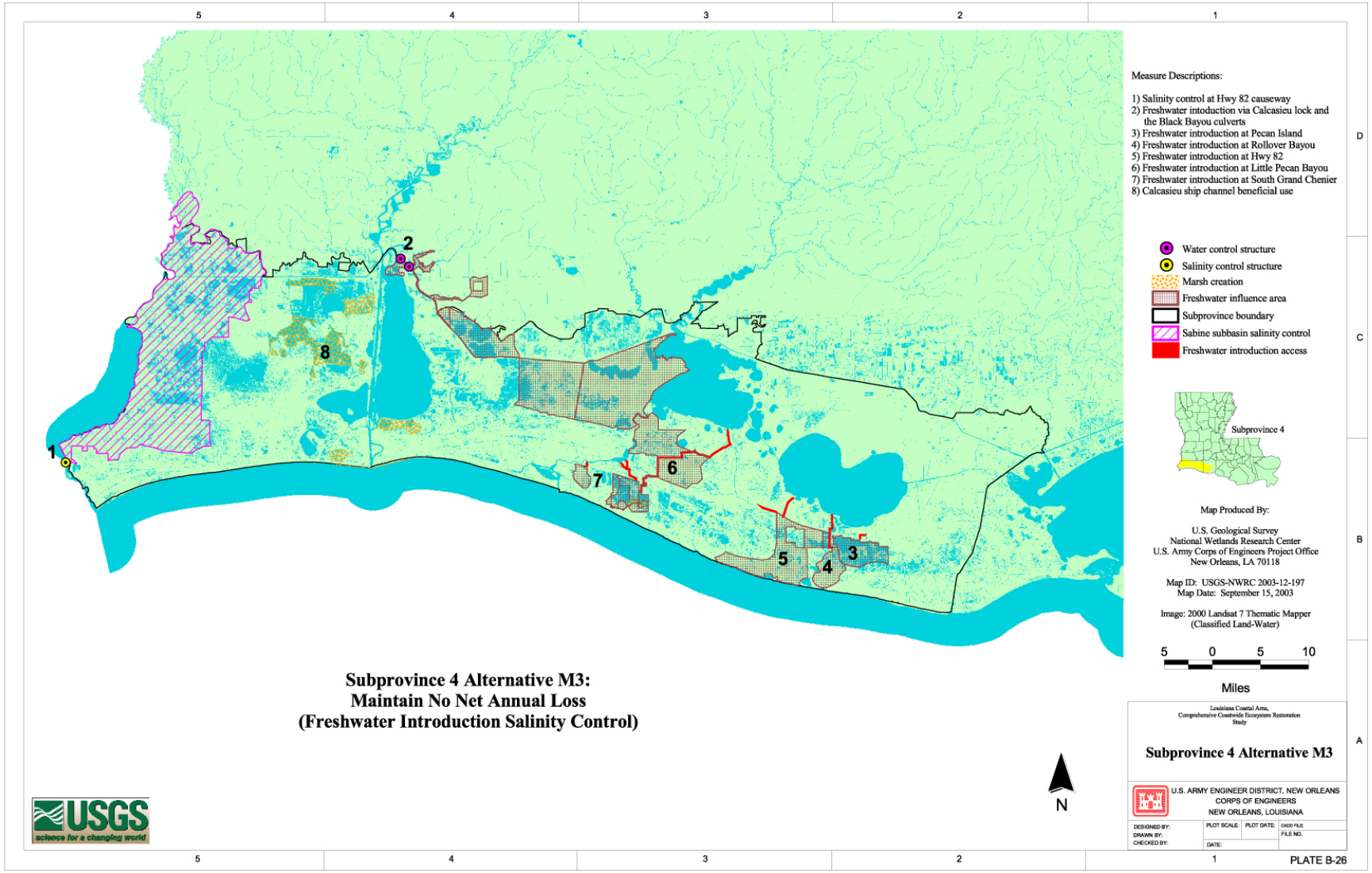
Measure Descriptions:
1) Salinity control at Hwy 82 causeway
2) Freshwater intoduction via Calcasieu lock and the Black Bayou culverts
3) Freshwater introduction at Pecan Island
4) Freshwater introduction at Rollover Bayou
5) Freshwater introduction at Hwy 82
6) Freshwater introduction at Little Pecan Bayou
7) Freshwater introduction at South Grand Chenier
8) Calcasieu ship channel beneficial use
Water control structure
Salinity control structure
Marsh creation
Freshwater influence area
Subprovince boundary
Sabine subbasin salinity control
Freshwater introduction access
Subprovince 4
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-197
Map Date: September 15, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classified Land-Water)
5 0 5 10
Miles
Subprovince 4 Alternative M3: Maintain No Net Annual Loss (Freshwater Introduction Salinity Control)
N
Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 4 Alternative M3
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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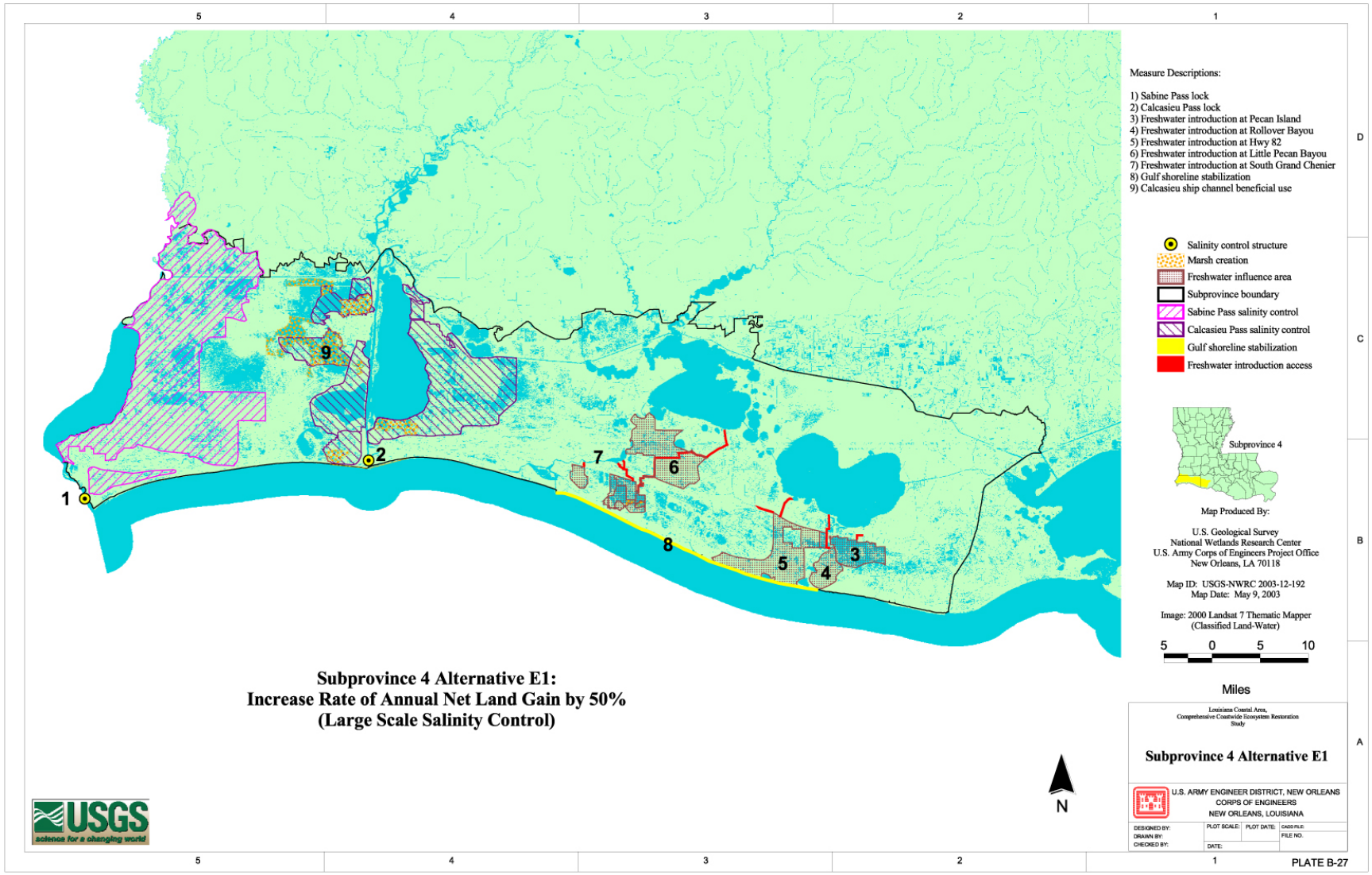
PLATE B-26


Measure Descriptions:
1) Sabine Pass lock
2) Calcasieu Pass lock
3) Freshwater introduction at Pecan Island
4) Freshwater introduction at Rollover Bayou
5) Freshwater introduction at Hwy 82
6) Freshwater introduction at Little Pecan Bayou
7) Freshwater introduction at South Grand Chenier
8) Gulf shoreline stabilization
9) Calcasieu ship channel beneficial use
Salinity control structure
Marsh creation
Freshwater influence area
Subprovince boundary
Sabine Pass salinity control
Calcasieu Pass salinity control
Gulf shoreline stabilization
Freshwater introduction access
Subprovince 4
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-192
Map Date: May 9, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
5 0 5 10
Miles
Subprovince 4 Alternative E1:
Increase Rate of Annual Net Land Gain by 50%
(Large Scale Salinity Control)
N
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 4 Alternative E1
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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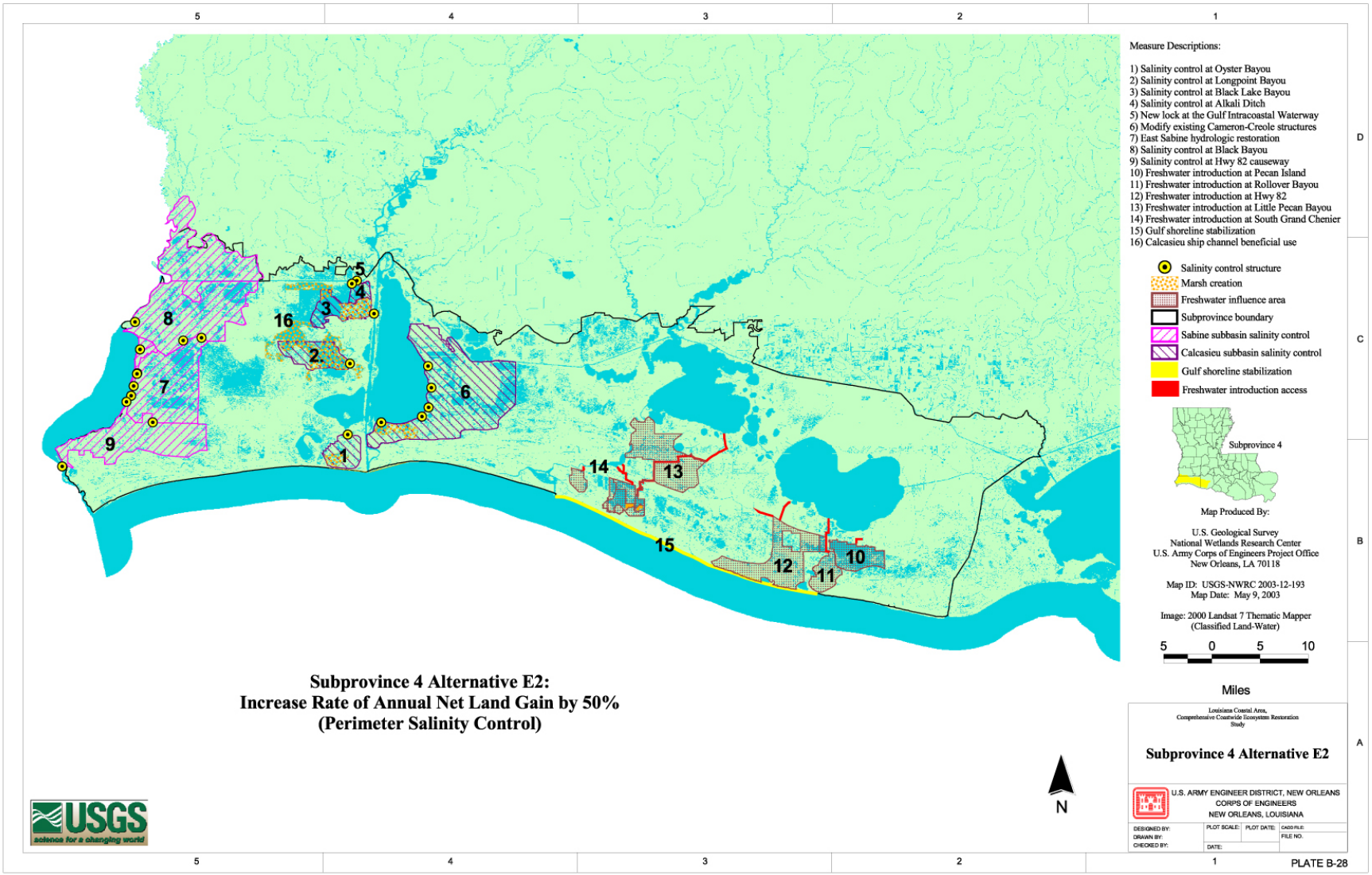
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
USGS
science for a changing world
PLATE B-27


Measure Descriptions:
1) Salinity control at Oyster Bayou
2) Salinity control at Longpoint Bayou
3) Salinity control at Black Lake Bayou
4) Salinity control at Alkali Ditch
5) New lock at the Gulf Intracoastal Waterway
6) Modify existing Cameron-Creole structures
7) East Sabine hydrologic restoration
8) Salinity control at Black Bayou
9) Salinity control at Hwy 82 causeway
10) Freshwater introduction at Pecan Island
11) Freshwater introduction at Rollover Bayou
12) Freshwater introduction at Hwy 82
13) Freshwater introduction at Little Pecan Bayou
14) Freshwater introduction at South Grand Chenier
15) Gulf shoreline stabilization
16) Calcasieu ship channel beneficial use
Salinity control structure
Marsh creation
Freshwater influence area
Subprovince boundary
Sabine subbasin salinity control
Calcasieu subbasin salinity control
Gulf shoreline stabilization
Freshwater introduction access
Subprovince 4
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-193
Map Date: May 9, 2003
Image: 2000 Landsat 7 Thematic Mapper
(Classified Land-Water)
5 0 5 10
Miles
Subprovince 4 Alternative E2:
Increase Rate of Annual Net Land Gain by 50%
(Perimeter Salinity Control)
N
Louisiana Coastal Area,
Comprehensive Coastwide Ecosystem Restoration
Study
Subprovince 4 Alternative E2
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
USGS
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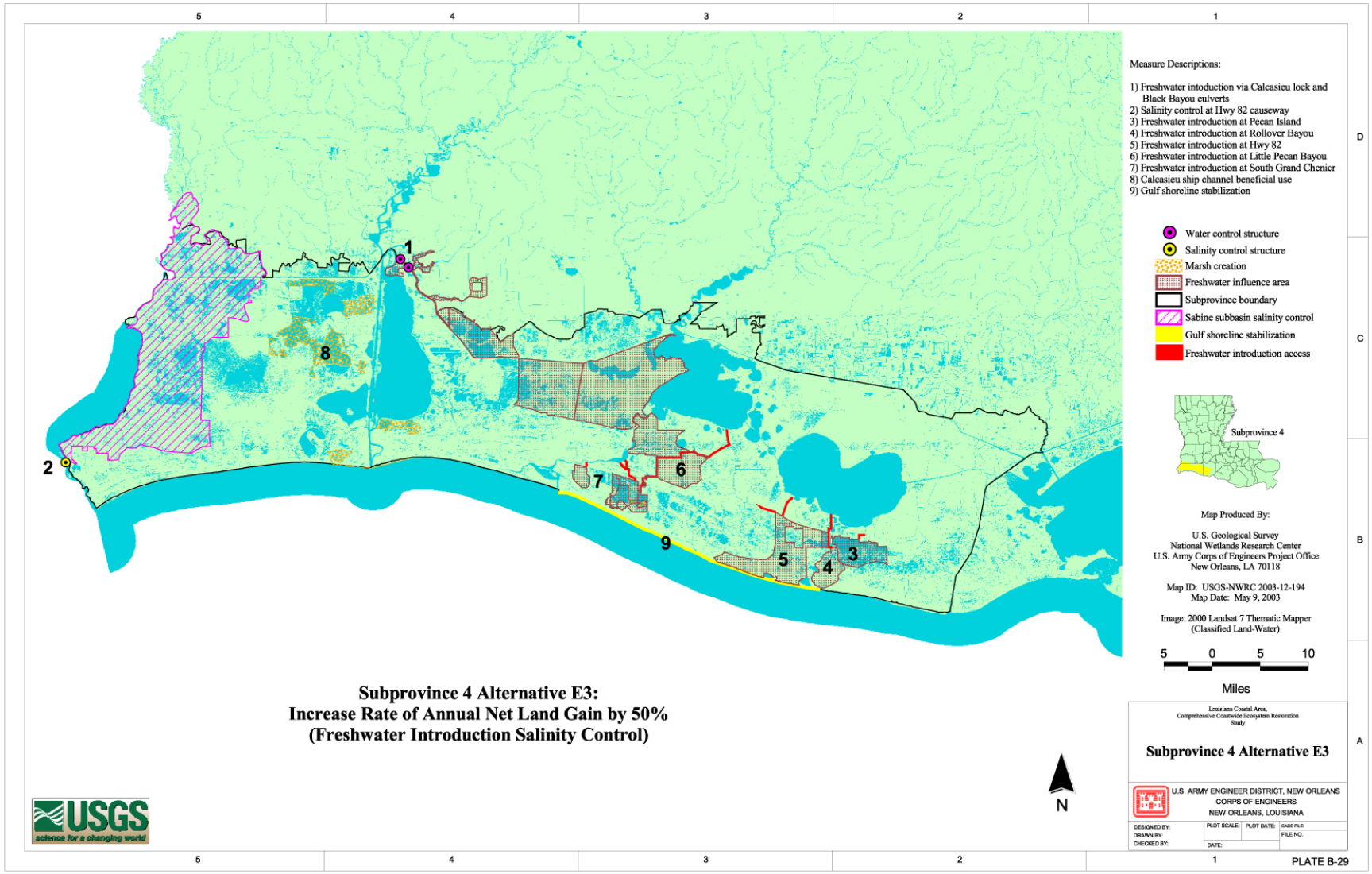
PLATE B-28


Measure Descriptions:
1) Freshwater intoduction via Calcasieu lock and Black Bayou culverts
2) Salinity control at Hwy 82 causeway
3) Freshwater introduction at Pecan Island
4) Freshwater introduction at Rollover Bayou
5) Freshwater introduction at Hwy 82
6) Freshwater introduction at Little Pecan Bayou
7) Freshwater introduction at South Grand Chenier
8) Calcasieu ship channel beneficial use
9) Gulf shoreline stabilization
Water control structure
Salinity control structure
Marsh creation
Freshwater influence area
Subprovince boundary
Sabine subbasin salinity control
Gulf shoreline stabilization
Freshwater introduction access
Subprovince 4
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-194
Map Date: May 9, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classified Land-Water)
5 0 5 10
Miles
Subprovince 4 Alternative E3:
Increase Rate of Annual Net Land Gain by 50%
(Freshwater Introduction Salinity Control)
N
Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 4 Alternative E3
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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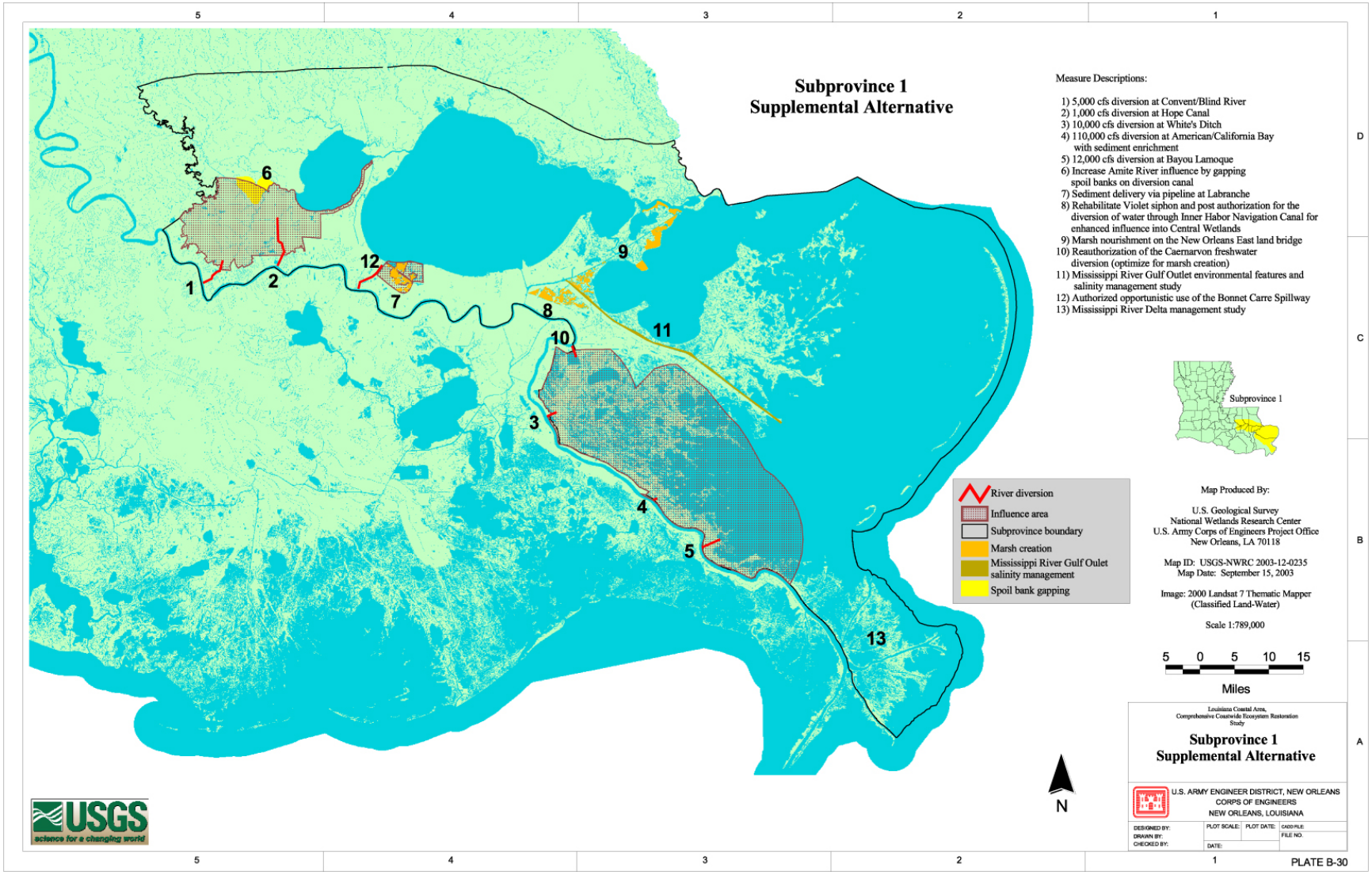
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
USGS
science for a changing world
PLATE B-29


Subprovince 1
Supplemental Alternative
Measure Descriptions:
1) 5,000 cfs diversion at Convent/Blind River
2) 1,000 cfs diversion at Hope Canal
3) 10,000 cfs diversion at White's Ditch
4) 110,000 cfs diversion at American/California Bay with sediment enrichment
5) 12,000 cfs diversion at Bayou Lamoque
6) Increase Amite River influence by gapping spoil banks on diversion canal
7) Sediment delivery via pipeline at Labranche
8) Rehabilitate Violet siphon and post authorization for the diversion of water through Inner Habor Navigation Canal for enhanced influence into Central Wetlands
9) Marsh nourishment on the New Orleans East land bridge
10) Reauthorization of the Caernarvon freshwater diversion (optimize for marsh creation)
11) Mississippi River Gulf Outlet environmental features and salinity management study
12) Authorized opportunistic use of the Bonnet Carre Spillway
13) Mississippi River Delta management study
Subprovince 1
River diversion
Influence area
Subprovince boundary
Marsh creation
Mississippi River Gulf Oulet salinity management
Spoil bank gapping
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0235
Map Date: September 15, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classified Land-Water)
Scale 1:789,000
5 0 5 10 15
Miles
N
USGS
science for a changing world
Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 1
Supplemental Alternative
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
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CHECKED BY:
PLOT SCALE:
PLOT DATE:
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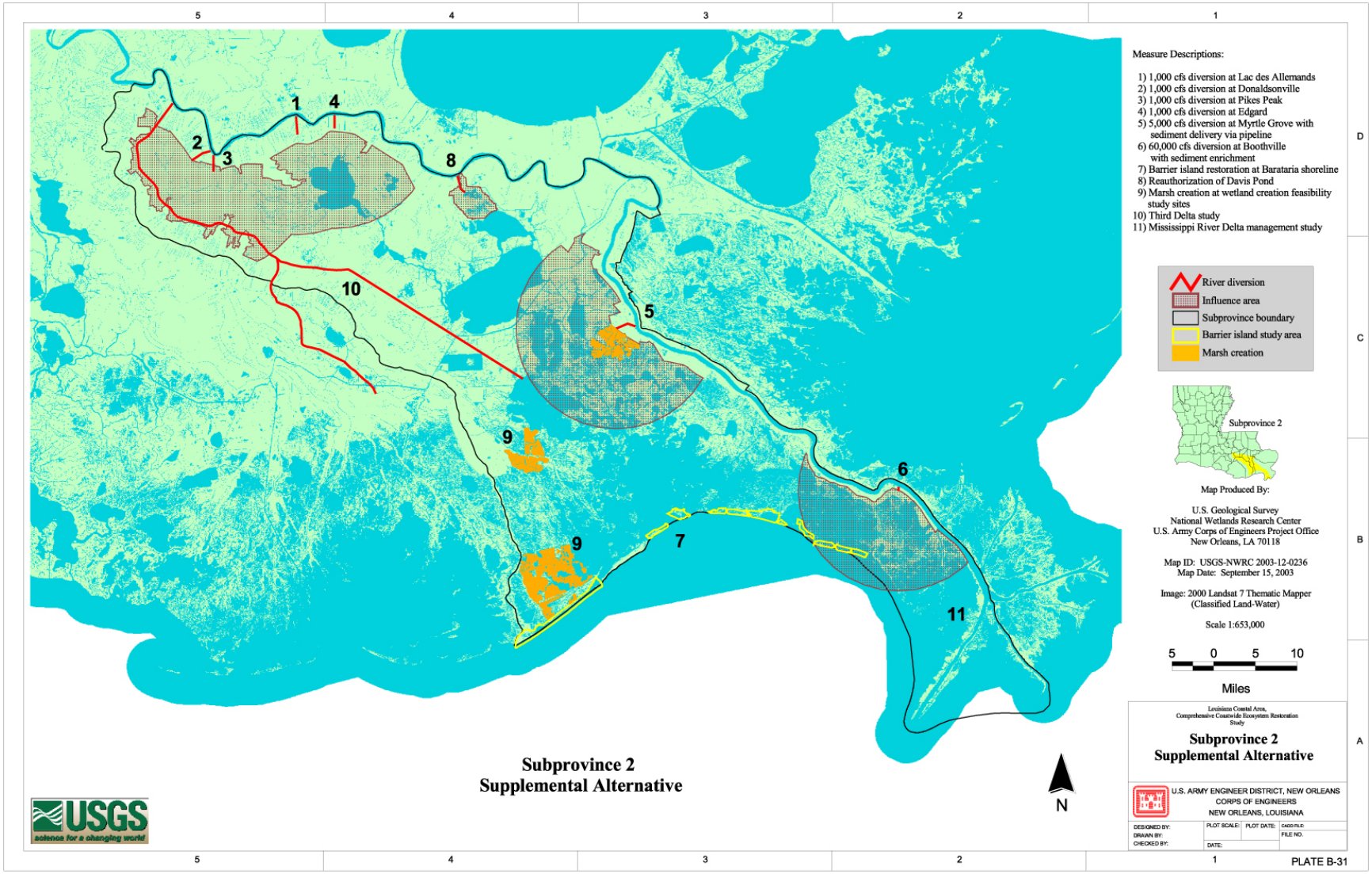
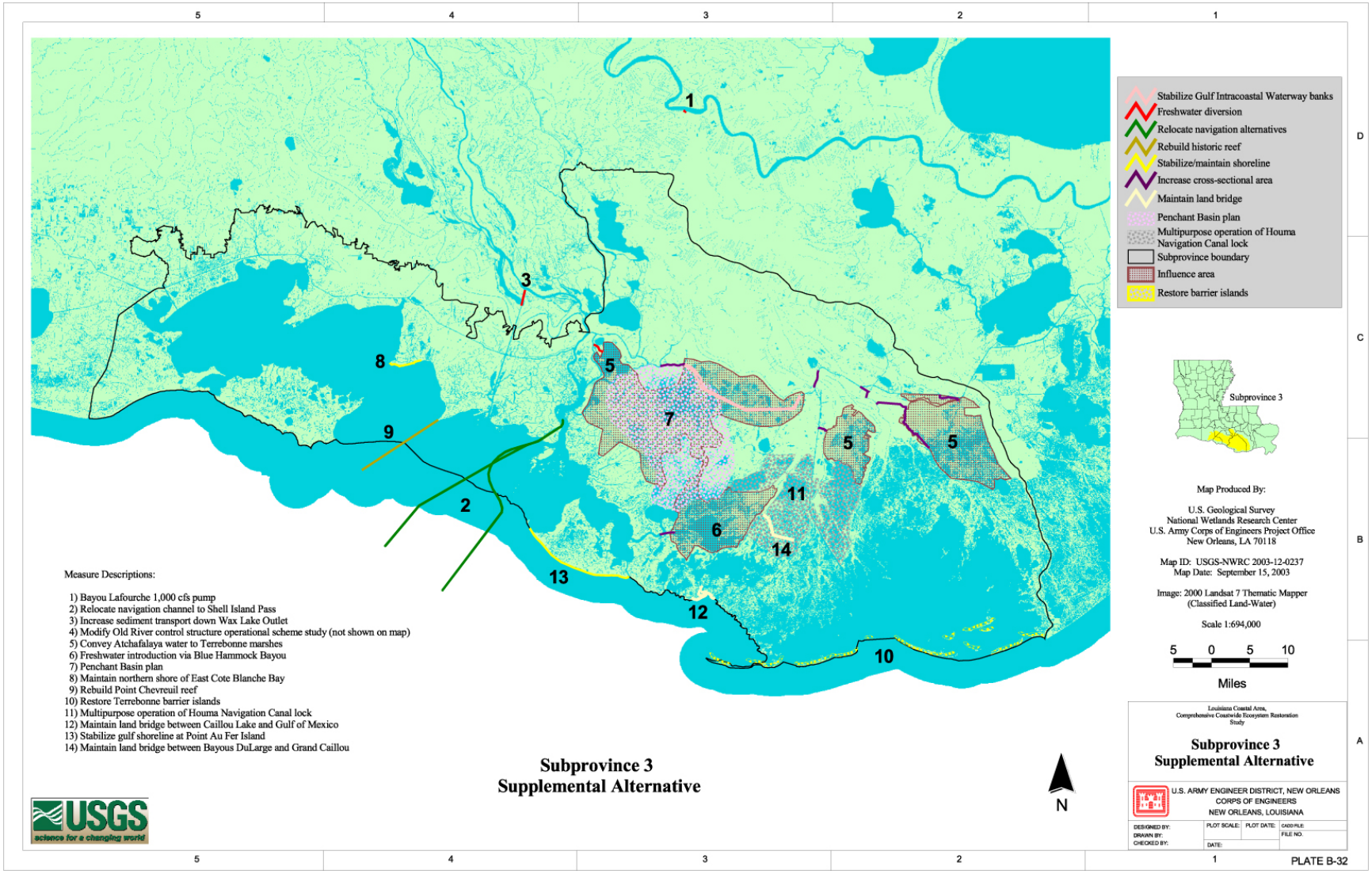
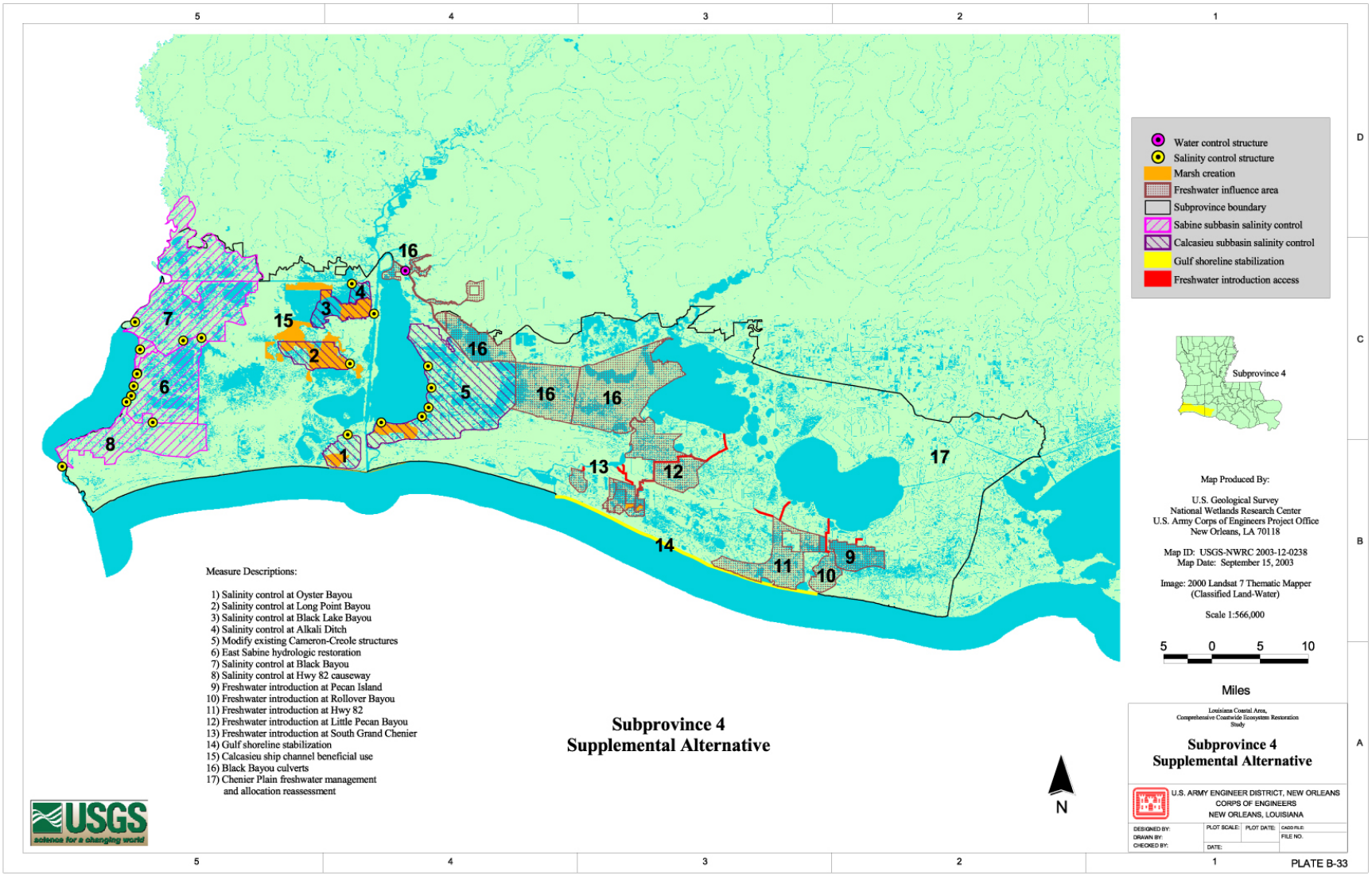
FILE NO.
DATE:
PLATE B-30


Measure Descriptions:
1) 1,000 cfs diversion at Lac des Allemands
2) 1,000 cfs diversion at Donaldsonville
3) 1,000 cfs diversion at Pikes Peak
4) 1,000 cfs diversion at Edgard
5) 5,000 cfs diversion at Myrtle Grove with sediment delivery via pipeline
6) 60,000 cfs diversion at Boothville with sediment enrichment
7) Barrier island restoration at Barataria shoreline
8) Reauthorization of Davis Pond
9) Marsh creation at wetland creation feasibility study sites
10) Third Delta study
11) Mississippi River Delta management study
River diversion
Influence area
Subprovince boundary
Barrier island study area
Marsh creation
Subprovince 2
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0236
Map Date: September 15, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classified Land-Water)
Scale 1:653,000
5 0 5 10
Miles
Subprovince 2
Supplemental Alternative
N
USGS
science for a changing world
Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 2
Supplemental Alternative
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY:
DRAWN BY:
CHECKED BY:
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
PLATE B-31


Stabilize Gulf Intracoastal Waterway banks
Freshwater diversion
Relocate navigation alternatives
Rebuild historic reef
Stabilize/maintain shoreline
Increase cross-sectional area
Maintain land bridge
Penchant Basin plan
Multipurpose operation of Houma Navigation Canal lock
Subprovince boundary
Influence area
Restore barrier islands
Subprovince 3
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0237
Map Date: September 15, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classified Land-Water)
Scale 1:694,000
5 0 5 10
Miles
Measure Descriptions:
1) Bayou Lafourche 1,000 cfs pump
2) Relocate navigation channel to Shell Island Pass
3) Increase sediment transport down Wax Lake Outlet
4) Modify Old River control structure operational scheme study (not shown on map)
5) Convey Atchafalaya water to Terrebonne marshes
6) Freshwater introduction via Blue Hammock Bayou
7) Penchant Basin plan
8) Maintain northern shore of East Cote Blanche Bay
9) Rebuild Point Chevreuil reef
10) Restore Terrebonne barrier islands
11) Multipurpose operation of Houma Navigation Canal lock
12) Maintain land bridge between Caillou Lake and Gulf of Mexico
13) Stabilize gulf shoreline at Point Au Fer Island
14) Maintain land bridge between Bayous DuLarge and Grand Caillou
Subprovince 3
Supplemental Alternative
N
USGS
science for a changing world
Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 3
Supplemental Alternative
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY:
DRAWN BY:
CHECKED BY:
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
PLATE B-32


Water control structure
Salinity control structure
Marsh creation
Freshwater influence area
Subprovince boundary
Sabine subbasin salinity control
Calcasieu subbasin salinity control
Gulf shoreline stabilization
Freshwater introduction access
Subprovince 4
Measure Descriptions:
1) Salinity control at Oyster Bayou
2) Salinity control at Long Point Bayou
3) Salinity control at Black Lake Bayou
4) Salinity control at Alkali Ditch
5) Modify existing Cameron-Creole structures
6) East Sabine hydrologic restoration
7) Salinity control at Black Bayou
8) Salinity control at Hwy 82 causeway
9) Freshwater introduction at Pecan Island
10) Freshwater introduction at Rollover Bayou
11) Freshwater introduction at Hwy 82
12) Freshwater introduction at Little Pecan Bayou
13) Freshwater introduction at South Grand Chenier
14) Gulf shoreline stabilization
15) Calcasieu ship channel beneficial use
16) Black Bayou culverts
17) Chenier Plain freshwater management and allocation reassessment
Subprovince 4
Supplemental Alternative
N
Map Produced By:
U.S. Geological Survey
National Wetlands Research Center
U.S. Army Corps of Engineers Project Office
New Orleans, LA 70118
Map ID: USGS-NWRC 2003-12-0238
Map Date: September 15, 2003
Image: 2000 Landsat 7 Thematic Mapper (Classified Land-Water)
Scale 1:566,000
5 0 5 10
Miles
Louisiana Coastal Area, Comprehensive Coastwide Ecosystem Restoration Study
Subprovince 4
Supplemental Alternative
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA
DESIGNED BY:
DRAWN BY:
CHECKED BY:
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE:
PLATE B-33